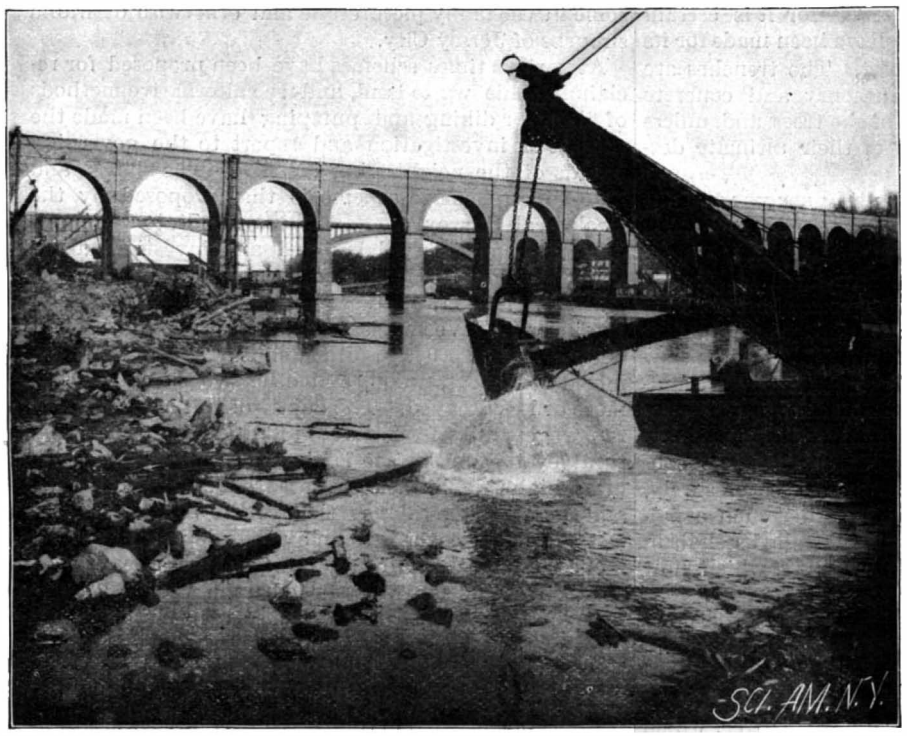
SCIENTIFIC AMERICAN

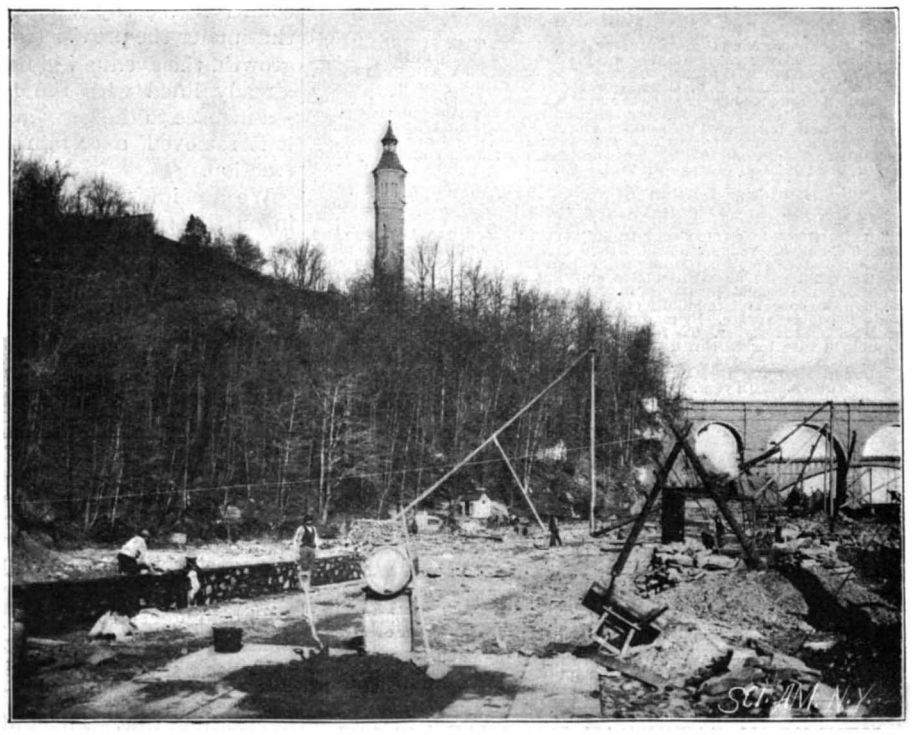
[Entered at the Post Office of New York, N. Y. as Second Class matter.]

A WEEKLY JOURNAL OF PRACTICAL INFORMATION, ART, SCIENCE, MECHANICS, CHEMISTRY, AND MANUFACTURES.

Vol. LXXVI.—No. 7. ESTABLISHED 1845. NEW YORK, FEBRUARY 13, 1897. $3.00 A YEAR. WEEKLY.



DREDGING FOUNDATIONS FOR STONE BULKHEADS.



BUILDING PLANTING SPACE AND FILLING IN BAYS, SOUTH OF HIGH BRIDGE.

Westerly Sidewalk. The Roadway. Easterly Sidewalk, showing the Timber and the Stone Bulkheads.

THE HARLEM RIVER SPEEDWAY—VIEW LOOKING NORTH FROM WASHINGTON BRIDGE.—[See page 104.]

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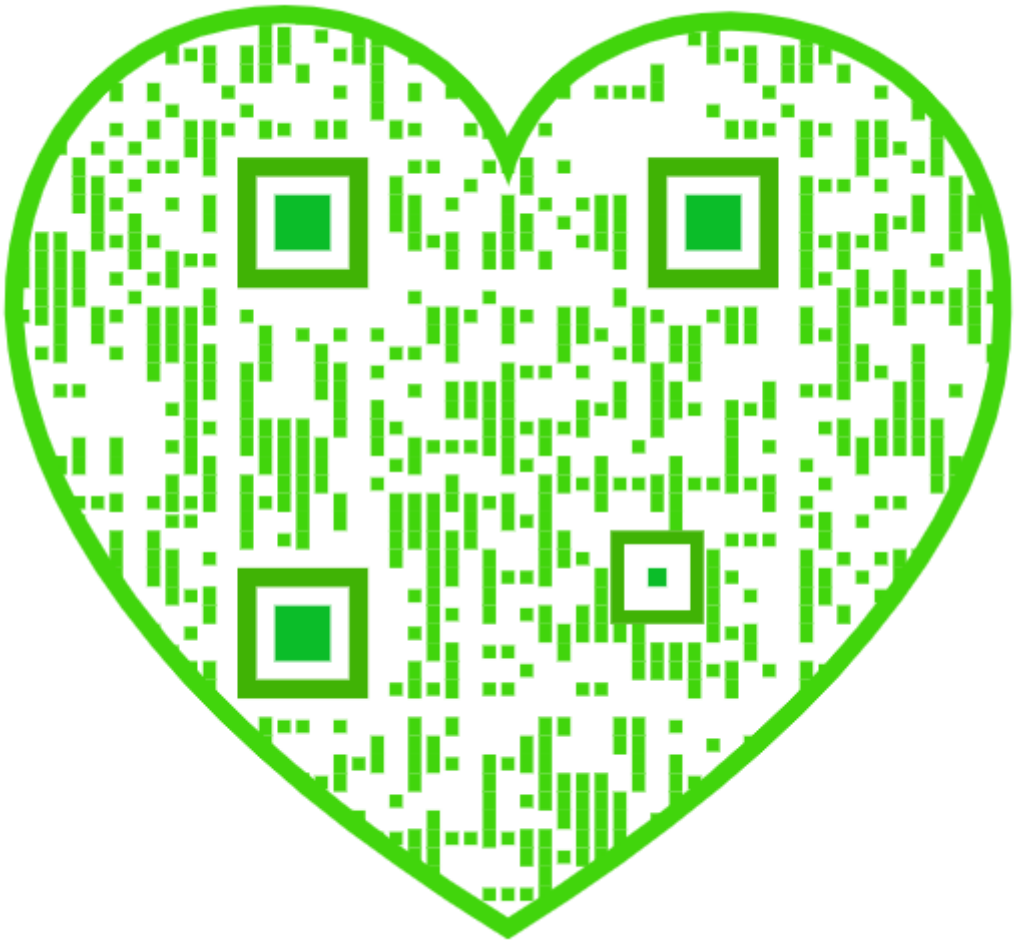

Scientific American.

ESTABLISHED 1845.

MUNN & CO., - - - EDITORS AND PROPRIETORS.

PUBLISHED WEEKLY AT

No. 361 BROADWAY, - - NEW YORK.

TERMS FOR THE SCIENTIFIC AMERICAN.
(Established 1845.)

One copy, one year, for the U. S., Canada or Mexico.....$3.00
One copy, six months, for the U. S., Canada or Mexico..... 1.50
One copy, one year, to any foreign country, postage prepaid, £0 16s. 5d. 4.00
Remit by postal or express money order, or by bank draft or check.
MUNN & CO., 361 Broadway, corner Franklin Street, New York.

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(Established 1876)

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(Established 1878)

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MUNN & CO., Publishers, 361 Broadway, New York.

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NEW YORK, SATURDAY, FEBRUARY 13, 1897.

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SHADE TREES FOR THE HARLEM SPEEDWAY.

It will be seen from our concluding article on the Harlem Speedway that the second section is marked by the same general excellence which was noted in our description of the first half of the work. On that part of it which lies north of Washington Bridge, there are no limitations such as necessitated a reduction in the width of the roadway on the first section, and the board was able to give the Speedway its maximum width and lay out the planting spaces continuously on each side of it for nearly the whole of the distance. It is here that the landscape features of the drive would have had an opportunity to show to the best advantage, and when the trees had grown to their full size they would have formed an avenue which, for stately dignity, reach of perspective, and beauty of surroundings, would have had no equal in the country. We say would have had—for it is certain that under the provisions which have been made for its growth, the avenue will never exist. The trenches are already lined with the fatal masonry and concrete—a menace to the early growth of the trees, and, unless it is removed, a certain cause of their ultimate destruction.

We are informed that the planting spaces were put in on the recommendation of a prominent landscape architect, now deceased; but it is not definitely stated, and we cannot believe, that he advocated walling up the roots of the trees with masonry. The bare suggestion of the thing is so radically opposed to the first principles of tree culture, that the public will be slow to believe that this device was suggested by a landscape architect, and a prominent member of his profession at that. But, admitting that the board was under the impression that this construction was contemplated by the architect, common sense, surely, should have called forth a protest against such a palpable absurdity, and sooner or later called a halt in the construction of some miles of walling, which, now that it has gone in, will have to come out again.

The longer one contemplates this device, the more amazing it appears. If ingenuity itself had set out to discover a sure tree-killer, it might have devised a more speedy, but it could never have found a more certain device than this. The outlying roots of a tree, which always delight to push their way among the crevices of such broken and rocky material as surrounds the present trenches, will here run up against a solid wall. Even if charity allows one to suppose that the minds of the responsible parties were clouded with absolute ignorance of tree growth, one would have thought that mere considerations of stability would have shown that a gale of wind blowing across the trenches would in all probability upset every tree that they contained. The roots being unable to take hold of the roadbed, the trees would have no more stability than was due to the weight of the narrow strip of mould, which, with its mass of embedded roots, would simply turn over in the trenches under the pressure of a high wind.

Unless the future appearance of the Speedway is to be ruined, there is but one course to pursue, and that is to stop all further construction of the trenches and remove every yard of wall that has been put in. It is certain that, if it is not removed now, it will have to be at a later date, and at a considerably greater expense to the city. Nor is it sufficient to say that the present construction, faulty though it be, will suffice for the needs of the next few years. A work of this kind is not built for a decade, but for all time. If the Speedway is to be beautified with trees, let the work be done in a manner that will be permanent—a credit to the skill, and not a monument in stone to the folly, of the present administration. We are willing to believe that the responsible parties have been actuated by the best of motives, and that they are desirous of making this public work a lasting credit to the city. It is in this belief that we have brought the matter publicly before their notice, with the hope that immediate steps will be taken to correct a serious error—an error whose evil effects will otherwise be as lasting as the work itself.

Structures of this kind are not built for a day, a decade, or a generation. In all the details of their planning and execution it should be borne in mind that they are intended for the use of the public in the years to come. In considering what to do in the present emergency this fact must not be forgotten. It would betoken a narrow spirit, a selfish point of view, to determine to let the planting trenches remain as they are, on the ground that their destructive action will not be felt in the immediate future. If the trees are put in at all, they should be planted with a reasonable conviction that their life will be measured by centuries.

Now that this matter has been brought to the attention of the Board, it behooves it to investigate the matter thoroughly and ascertain who is responsible for this wretched work, which has cost the city so many thousands of dollars and which has provided what is likely to prove, not a feature of beauty in time to come, but an ever increasing source of regret and mortification at the shortsightedness or lack of judgment of the projectors of the work.

THE RECLAMATION OF THE NEW JERSEY MEADOWS.

Travelers who come to New York over the railroads that have their terminal stations in Jersey City will remember the long stretch of marshy land which is crossed just before reaching the outskirts of the latter city. It forms a prosaic and monotonous finish to the picturesque ride through New Jersey, and is apt to give a first and last impression of metropolitan surroundings which is in flat contradiction to the reputation for picturesque beauty to which the environs of New York are justly entitled.

The objections to the meadows on the ground of their intrinsic ugliness, however, is the least serious that can be raised, for their existence has always been a menace to the health of the surrounding districts, and in the summer months they form a prolific breeding ground for the hordes of mosquitoes that render life burdensome in the many picturesque and otherwise desirable suburbs of Jersey City.

At various times schemes have been proposed for reclaiming this waste land, and the alternative methods of filling or diking and pumping have been made the subject of investigation and report to the governing boards of the neighboring districts. The latest and most comprehensive scheme is that proposed by the Geological Survey of New Jersey. State Geologist Smock recently visited Holland and investigated the vast drainage systems in that country, and the whole matter is made the subject of an exhaustive report by Engineer C. C. Vermuele, from which we learn that underlying the 27,000 acres of marsh is a mass of alluvium mixed with peat, wood, and other vegetable matter, more or less decayed. The depth of this accumulation ranges generally from seven to fifteen feet. The natural level of the surface is three or four inches above mean high tide, but the whole is frequently overflowed, and such extreme tides as that of the second week of last November cover it to an average depth of eighteen inches. Lately an unhealthy and undesirable population is beginning to be crowded upon them. Twelve lines of railroad cross the marshes, six of them trunk lines, and the impression made is unprepossessing.

It is stated that of the two systems of reclamation, filling and diking, the latter is the better and, indeed, the only one feasible in this case. It is stated that, even if these marshes are filled up for city purposes, pumping will still have to be resorted to, as there will not be sufficient fall to sewer and drain the district by gravity. Filling to the extent of six feet will cost an average of $2,500 per acre. The area can be embanked and pumping works installed for about $1,000,000, or less than $40 per acre.

As the taxable value of the neighboring districts is about $3,000,000,000, the cost of this improvement could readily be borne, even if it presented no return other than improved sanitary conditions and a mitigation of the mosquito pest. To make the improvement of the greatest sanitary benefit, the whole area should, as rapidly as possible, be brought under cultivation.

It is recommended that at first only the embankments and main ditches and pumping plants should be constructed, the whole area being laid out in twenty acre farms and sold as promptly as possible, on the express condition that they should be immediately and thoroughly ditched and brought under cultivation. It is urged that the prompt improvement of each plot should be considered more important than the purchase price. As soon as sanitary conditions have been brought about, the improvement of water front and business and manufacturing sites could be carried out as fast as they could be sold, the proceeds paying for the improvements.

The interest charges and operating expenses are estimated at $6 to $7 per acre, and it is predicted that in a few years this charge could be entirely covered by assessments on the property itself, any deficiencies in the interim being met by the surrounding districts that are benefited by the undertaking.

If the estimates of the report are not too sanguine, the whole scheme should meet with hearty approval. The substitution of over forty square miles of good land for a dismal and malodorous swamp in the midst of a district whose taxable value is $3,000,000,000 is a proposition that should commend itself strongly to the authorities and property owners who are immediately affected, and indirectly to the State at large.

THE GREEN CROSS.

In addition to the Red Cross Society and the White Cross, which gives aid to sick or convalescent soldiers, there has just been established at Vienna a new order which will be known as that of the "Green Cross," says the Medical Record. Its object and aim is to give succor to Alp climbers and excursionists in mountain regions. It originated in the Austrian Alpine Club. The intention is to establish huts upon high mountains and to keep supplies and relief stores or boxes containing articles apt to be required in emergencies at conveniently located points. Besides this, guides are to be instructed in first aid to the injured and trained in the application of splints and antiseptic dressings. We wish the society with its new-colored cross all success in its humane undertaking.

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THE NICARAGUA CANAL.

At a time when the promoters of the Nicaragua Canal bill are urging the government to assume the financial responsibility of the undertaking by guaranteeing the principal and interest of the bonds of a private company to the amount of $100,000,000, there are one or two cardinal facts which need to be kept prominently in the public eye, particularly as there seems to be a disposition on the part of the promoters of the bill to keep these facts conveniently out of the discussion.

We have always been favorable to the Nicaraguan Canal as such, and there is no public journal that would be more gratified than our own if it could be proved that the canal can be built for a sum of money upon which the prospective traffic would pay a reasonable rate of interest. But, as the matter now stands, this is a vital question upon which everybody is in the dark, and nobody more so than the engineers themselves.

It is now about four years ago that a previous effort was made to secure a government guarantee of the bonds. Some doubts were expressed at the time as to the estimated cost of construction; and the absence of any accurate information on this head led to the rejection of the bill and the appointment of a board of experts to make an independent examination for the government. Three engineers of high standing, respectively in the army, the navy, and in civil practice, made an examination on the ground of the proposed route of the canal. They made as complete an investigation as the funds at their disposal would permit, and their report stated that the estimates of the canal company's engineers would have to be raised from $69,893,660 to $133,472,893, or practically doubled.

It was evident that the government experts considered the estimates of the canal company's engineers to have been based upon a too rapid and superficial survey of the route and that the data was too incomplete to give them any reliable value. As an instance of the discrepancy between the figures of the two estimates, it may be mentioned that the maximum flood discharge of the river near the Ochoa dam was estimated at 42,000 cubic feet per second by the company's engineers and at 150,000 cubic feet by the government experts. The great Ochoa dam, in some respects an unprecedented undertaking, was estimated by the company to cost $977,000 and by the board of engineers to cost $4,000,000! These are only two instances out of a lengthy report which proved that, as the affairs of the canal then stood, any legislation by the government would have been simply a leap in the dark. The report concluded with a recommendation that the sum of $350,000 be appropriated for an exhaustive examination, which should extend over eighteen months, or long enough to enable a reliable estimate of the rainfall to be obtained.

Now it is obvious that the next natural thing to do would have been to have the sum voted and the expert commission sent out. The high character of the engineers was a guarantee of the sincerity of the report, and it stood there, as it stands to-day, an insuperable barrier to any flotation of bonds for construction of the work. If the aims of the canal company were to build a great engineering work that should be a benefit to commerce and a profitable investment for capital, they should at once have pressed for the execution of such a survey as the expert board recommended. There was nothing to lose and everything to gain by a bona fide investigation of what the canal company presented as a bona fide scheme. Provision for the survey could readily have been secured, and by this time reliable data would have been available.

Instead of following this very obvious course, the canal company has done everything in its power to throw discredit upon the report of the professional men who were sent out to safeguard the interests of the nation, and the promoters of the bill have ignored the report altogether. They are now seeking to push through the bill in its original form, with its enormous guarantee of $100,000,000 of bonds for the construction of a work which nobody knows very much about.

Why this haste? If the canal scheme is a good one it will bear investigation, and if the nation is to be virtually committed to its construction, it surely has a right to know the cost. This it does not know, and, as the experts have shown, has no means of knowing at present; and the action of the promoters of the bill in trying to shut out investigation is likely to prove the most effective agent in bringing about its defeat. There is no doubt but what the course pursued by the company and its representatives is discrediting the whole scheme in the eyes of the nation. Charges are being freely made that a complete examination is what the parties who have charge of the enterprise are most anxious to avoid. If this conviction should once become general, the scheme will receive a setback from which it may take many years to recover.

We are fully alive to the sentimental reasons for the construction of the canal with American capital, and for its being subject to American control. But no amount of sentiment can alter the fact that there is a right way and a wrong way to bring this about. If the canal is practical, by all means let it be built; but let it be done according to everyday business principles, and not in direct violation of them. It is not too late for the friends of the canal to secure an appropriation for that careful survey and estimate which is the necessary precursor of all great engineering works. When the survey has been made and the report presented, the nation will be able to consider intelligently the question of government support or control.

A RAPID TRANSIT TUNNEL BETWEEN NEW YORK AND BROOKLYN.

A deep tunnel scheme for rapid transit between New York and Brooklyn is recommended by a commission which was appointed by the mayor of the latter city to arrange a plan for improving rapid transit facilities on certain of its streets. The plan proposed contemplates an electric line (partly in tunnel and partly on an elevated structure) from Cortlandt Street and Church Street, New York, to Ralph Avenue, Brooklyn.

It is proposed to have a low level station at Cortlandt Street, New York, about 70 feet below ground, connecting with the streets and the elevated roads in that city by means of elevators, the tunnels being carried thence to a station at Maiden Lane and Pearl Street, with connections with the Second and Third Avenue railways; thence under the East River and under Pineapple Street and Fulton Street to a station near the City Hall, Brooklyn; from thence under Fulton Street and Flatbush Avenue to the Flatbush Avenue station, where it would be about 18 feet below grade. The tunnel will be carried under the Brooklyn streets within the curb lines to a station at the City Hall, where it will be 115 feet below the street grade, and will rise by an easy grade from that point, so that the bottom of the tunnel shall come above the main relief sewer at Flatbush Avenue and Hanson Place before passing into the depressed station.

Continuing from Flatbush Avenue station, along Atlantic Avenue, the tracks are depressed to Bedford Avenue, a distance of 6,700 feet, the depression being covered by means of girders and masonry arching, restoring the surface of the street for public use for its full width. From the east side of Bedford Avenue the railway tracks will rise rapidly in an open cut to the grade of the street, and, continuing to rise, will pass onto an elevated railway structure, which, at Nostrand Avenue, will attain such height that full head room will be provided for all street traffic without interference.

The physical characteristics of the ground between Bedford and Nostrand Avenues are such that the rising grade of the railway and the falling grade of the street combine to favor this transition from a depressed to an elevated structure, so that no obstruction is caused to any existing cross street, and full advantage is taken of the length of this block between Bedford and Nostrand Avenues (which is the longest on Atlantic Avenue). At Nostrand Avenue an elevated station is proposed, and the elevated structure continues thence a distance of 8,010 feet to Ralph Avenue.

The project is a modified form of the plans prepared some four years ago by the Long Island Railway Company, who thereby sought to secure a New York terminal for their system. We understand that the company is disposed to work in harmony with the commission, and such a connection will be in line with their efforts to secure entry into New York by other tunnel schemes, and notably by the proposed Blackwell's Island bridge.

The construction and operation of deep tunnel electric roads such as this has long ago passed the experimental stage. They can be built at a reasonable cost, and their construction does not involve any problems of engineering that are not well within the control of modern skill and resources. The success of the existing tunnels of this kind in London has shown that there is no popular objection to subterranean travel. If the proposed New York and Brooklyn tunnel is built, its extension to the Jersey side to connect with the Pennsylvania system would merely be a question of time.

SCHEMES FOR CHECKING RETURNED NEWSPAPERS.

The Tribune has examined carefully the different devices which have been submitted, at least one hundred in number, for indicating whether a newspaper has been sold and read. They all show great ingenuity, and many of the Tribune's friends have spent much time and thought over the subject. To all of them this office extends its most sincere thanks. Owing to the peculiar construction of a modern web printing press, the majority of the plans submitted are inapplicable without actually building a new press to utilize the invention; and the enormous expense of a printing press puts that out of the question. In the construction of a new press they could be applied, if thought best, however.

Speaking broadly, the devices suggested fall into four groups:

First—Twenty or more correspondents have proposed the fastening of adjoining leaves or the whole paper at the edges with a wire staple, rivet or other metal attachment. Some of these schemes are practicable, although special machinery would have to be built to make use of the idea. They would all require the tearing out of a part of the paper during the reading.

Second—Others have suggested the pasting of a gummed label or seal over the leaves of the paper. This again is practicable to a certain extent, particularly in presses which run at a slow speed. In a rapid press it is doubtful whether the idea could be utilized. And as for pasting together the whole edges of two adjoining leaves, one might as well let the paper remain uncut altogether; that would be the most perfect of sealing and canceling devices; but enormous sums have been expended by all the great dailies simply and solely to be able to send their papers to their readers with the edges cut. No backward step can be taken in that regard.

Third—The punching of a hole in the margin of the paper has been proposed by so large a number of men and women that one marvels at the fact. All sorts of holes are suggested, the majority of them in artistic forms. The idea of the proponents is that two things will happen. First, if a paper is read, as it is, by all members of a family, it will be so crumpled that if any one attempts to fold it in its original form the edges of the punched-out hole will not thereafter correspond, which will indicate the facts of the case. Second, that the paper which is punched out and left hanging, like a tongue, will be torn off in reading, and the absence of the tongues of paper will tell the story. There is something in this idea, but its value can only be revealed by actual experiment. So far, the experiments of the Tribune have been inconclusive.

Fourth—Many have proposed the pasting together of the leaves of the paper in two or three places. In reading, the paper must be torn apart where pasted, because no one could read the interior pages unless he did so. This is a practical device, and the one easiest of application. It has the disadvantage of tearing the margin of the papers, the disfigurement being greater or less, according to the haste with which the finger is thrust in and the leaves torn apart.

Two or three men have suggested one other idea, namely, the use of invisible ink, but there are various reasons why such a method would not be in the least conclusive. Some of the plans proposed are patentable; and if the one best way could be found and could be patented, the inventor would be able to derive an excellent revenue from it.—Tribune.

OUR NEW TORPEDO BOATS.

Torpedo boat No. 6, which has just been completed by the Herreshoffs, was sent on a preliminary trial run by her builders on January 20, when she made a speed of 26·85 knots. The result was very gratifying to the firm, considering the circumstances of the trial; for the run was made with an untrained crew in the engine room and under reduced boiler pressure. The contract calls for a speed of 27½ knots under 220 pounds of steam, and as the little craft was carrying only 180 pounds to the square inch, it was confidently believed that under the favorable conditions of a trial trip 28 knots an hour will be realized. The water was fairly smooth, the breeze blowing across the course, which was a part of that which has been laid out for the official trial.

The expectations based upon this performance were realized in another builders' trial, on February 5, during which, in a series of eight runs over the measured mile course in Narragansett Bay, she averaged 28·76 knots an hour. Her highest speed was 30·1 knots, and every mile was run off at a higher speed than the contract calls for, viz., 27½ knots. The steam pressure ranged from 205 to 225 pounds to the square inch, the latter being the maximum allowed.

THE MODERN VERSION OF SUPPLY AND DEMAND.

Prof. Thurston, in the pages of Science, discredits the generally received idea that increased demand implies increased prices, and that an increased supply causes lower prices. This is not the case. It may be the case momentarily, but, in the long run, "increased demand and an enlarged market, by permitting more economical operation of the system of production, decrease prices." He instances the copper production of the Lake Superior mine. In operation for years, it has been in competition with such mines as the Calumet and Hecla, and has yielded almost uniform profits all the time. The cost of production has been reduced to one-half what it was a generation ago, and the value of labor has been correspondingly reduced per ton of product, and the market price of labor has gone up. In the open market, the price of a commodity is practically the cost of production plus a fair business profit. If this result is not obtained, a business languishes or expires. If profits are abnormally large, capital is attracted and competition set up, and the availability of capital now brings about the modern fact that increased demand causes reduced prices.

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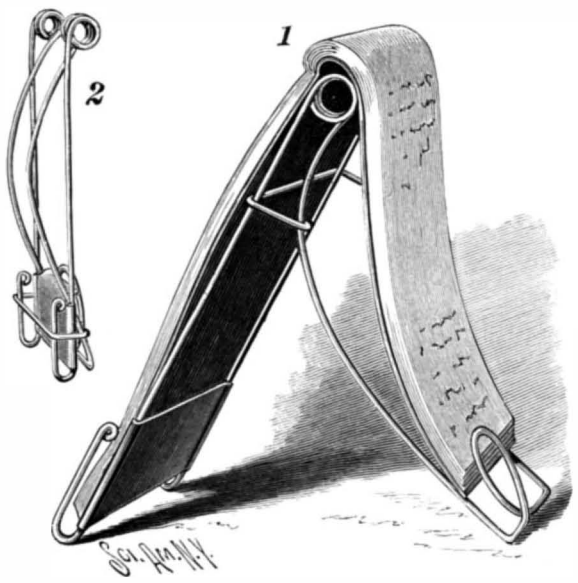
A HANDY NOTE BOOK HOLDER.

The cut shows a simple little note book holder invented by W. T. Ives, of No. 41 Tompkins Place, Brooklyn, N. Y., and designed primarily for stenographers in copying their notes. It will also hold letters and many kinds of books very nicely. In the illustration Fig. 1 represents it with a note book in place for copying, Fig. 2 representing the device



IVES' NOTE BOOK HOLDER.

folded. It is practically made of a single piece of wire coiled to form a spring connection between the front and rear standards. The front standard wires are turned up at the base to keep the leaves of the note book from flying up, while the wires of the rear standard are connected at the base by a single coil, to form a clip which holds all or a part of the leaves firmly. A keeper, which slides easily on the rear standard when the tension of the springs is released, regulates the inclination of the book. When not in use, the device folds into a small space, and can be conveniently carried in the pocket. It weighs but two ounces, which is a great improvement over the heavy, bulky holders on the market to-day.

A HORSELESS FIRE ENGINE.

There is now being constructed for use by the Boston Fire Department a horseless steam engine, of great size and power, having a contract capacity of 1,350 gallons of water per minute, but the builders, in view of recent tests, are confident that this engine will throw 1,850 gallons of water per minute. For some time past the fire commissioners of nearly all the great cities have had under consideration the question of adopting a specially powerful steam fire engine for use in portions of the city in which the great office buildings are located. A fire in one of the upper stories of the tall office buildings renders the ordinary methods of fire fighting futile.

From experience gained in recent fires, it became evident that one of two things must be done, if the constant menace of a disastrous fire were to be avoided. Either a limit must be placed on the height of buildings, or more powerful engines, capable of throwing higher streams of water, must be obtained for use in the districts containing the lofty structures. The heaviest fire engine for horses weighs 10,000 pounds, and requires three horses to get it about the city It has a guaranteed capacity of 1,100 gallons per minute. A heavier engine would be almost unmanageable, if horses were used as a means of moving it about from place to place, and in the narrow streets of Boston and lower New York it is even difficult for an engine with three horses to make rapid progress, and the liability of some of the horses becoming injured is also very great.

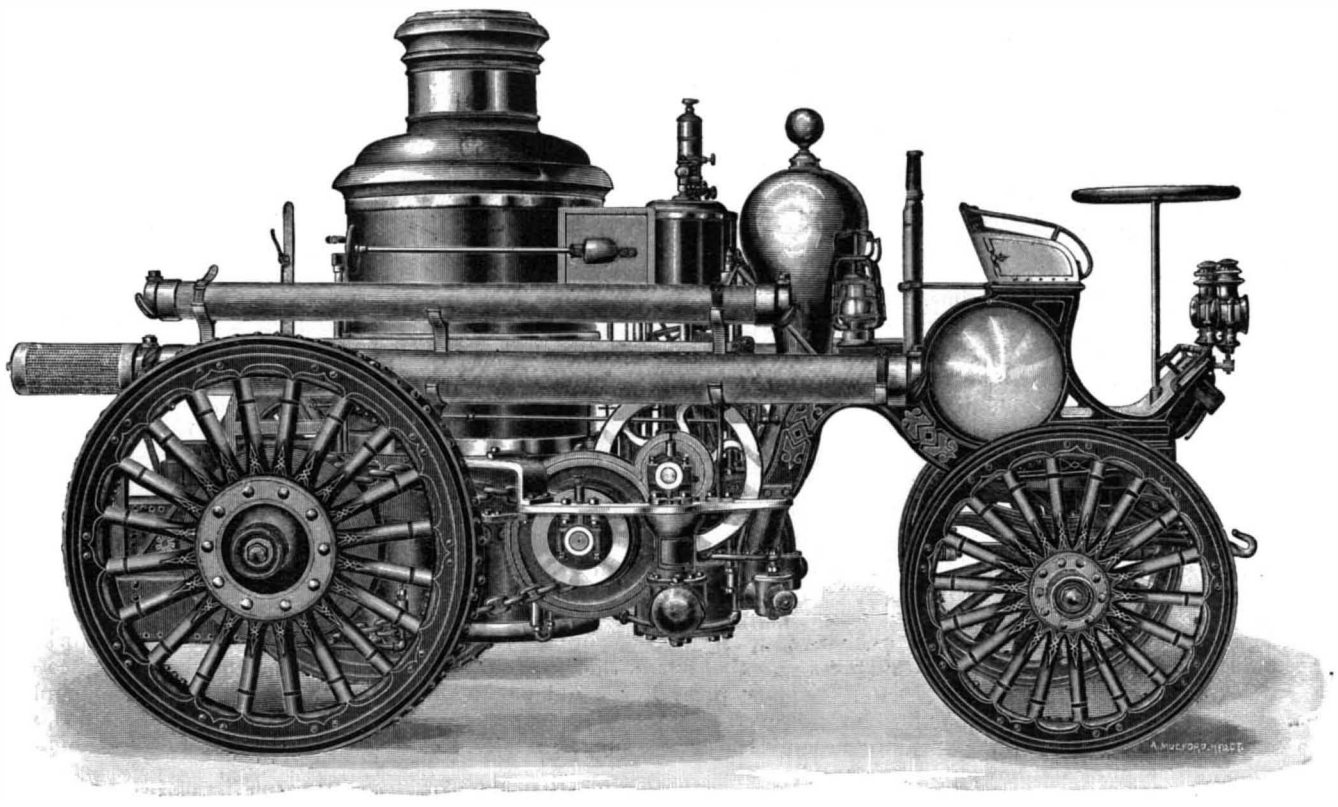
In view of these facts, it was decided by the Boston Fire Department that a "double extra first size self-propeller," as it is called, should be ordered, having steam for a motive power. There have been many attempts in the past to build and put into practical service steam-propelled fire engines. Among the first was one constructed in 1840 by Capt. John Ericsson, of Monitor fame. In the main his engine was a success, but the opposition was so strongly against it that, after a brief period of service, the engine was abandoned.

The horseless fire engine which we illustrate is built by the Manchester Locomotive Works, Manchester, N. H., and is one of the Amoskeag type. From the ground to the top of the engine is 10 feet; its length over all is 16 feet 6 inches, and the width over all is 7 feet 3 inches. The weight equipped for service is 17,000 pounds. The boiler is upright and tubular in style, with a submerged smoke box, and is expanded at the lower end to increase the grate surface. It is made of the best quality of steel plate, with seamless copper tubes, and is thoroughly riveted and stayed. It is jacketed with asbestos and has a lagging of wood which supports the metallic jacket. The connections with the steam cylinders are simple and have the advantage of being entirely unexposed to the air. The steam cylinders are cast in one piece. They are firmly secured to the boiler and framing and are covered with a lagging of wood, with a metallic jacket on the outside. The main shell of the pump is in one solid casting. It is a double acting and vertical pump and its valves are vertical in their action. The pump is arranged for receiving suction hose on either side and has outlets on either side for receiving the leading hose. The connection between the steam cylinders and water cylinders or pumps may be made by the old and familiar link motion and link block, or the equally familiar crosshead and connecting rod plan, both giving excellent results for ordinary steam fire engines; but in the self-propelling engine, where the engine power is transmitted to the driving wheel through the main crank shaft, which is not the case when this power is transmitted to the pumps, the crosshead and connecting rod plan has many advantages, and is therefore adopted for self-propelling engines. A self-propelling engine of the type we illustrate, made for the city of Hartford, Conn., at its first trial threw through fifty feet of leading hose, 3½ inches in diameter, horizontal streams as follows:

1½ inch nozzle	348 feet.
1¾ inch nozzle	338 "
2 inch nozzle	319½ "

The manner of handling the self-propellers is very simple. The chief engineer rides on the fire box of the engine and has directly under his hand the various levers and wheels which start, stop and regulate the speed of the machine. The assistant engineer rides on the driver's seat, and by means of the large steering wheel he steers the machine in exactly the same manner as the rear wheels of the long ladder trucks are governed through a system of bevel and worm gearing. The engine can be turned around in an ordinary street with ease.

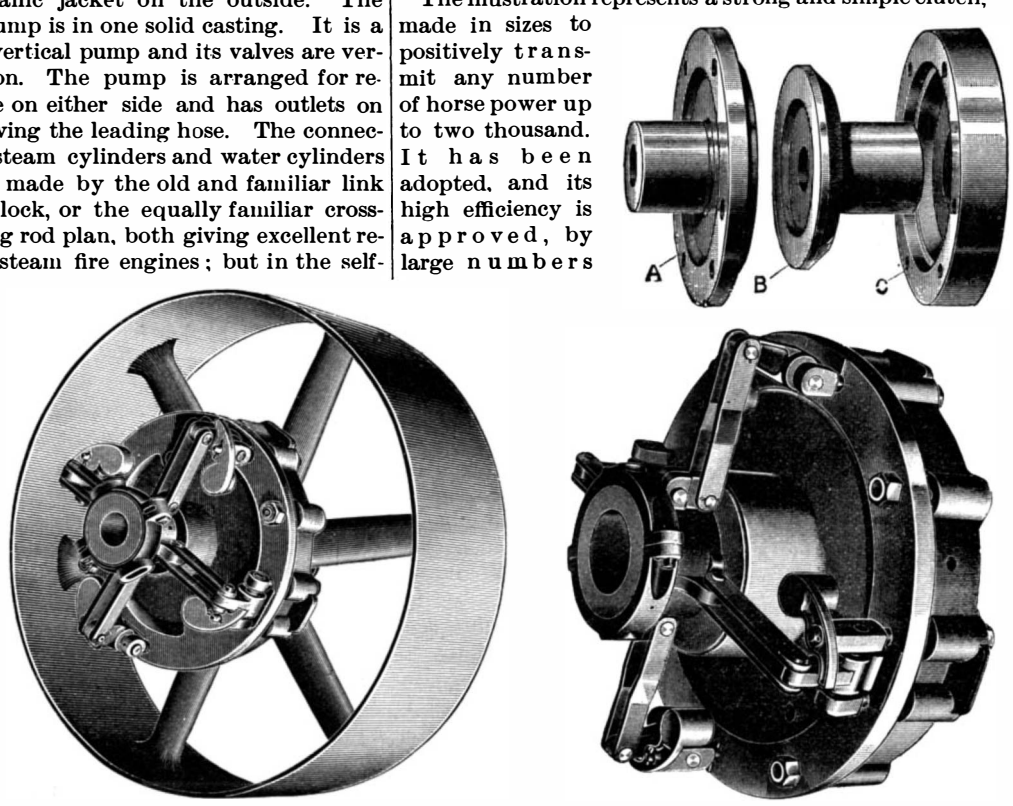
Very little machinery in addition to the ordinary mechanism of a fire engine is required to operate the self-propellers. The road driving power is applied from one end of the main crank shaft to an equalizing compound, and two endless chains running over sprocket wheels on each of the main rear wheels permit these rear wheels to be driven at varying speeds when turning corners. The driving power is made reversible, so that the engine may be driven forward or back at the will of the operator. When it is not necessary to use the power of the engine for driving purposes, the driving mechanism can be disconnected by the removal of a key, so that the pumps may be worked with the engine standing still. An extra water tank is carried at the rear of these engines to supply the boiler until connections can be made with a hydrant. The self-propeller can travel on a fair level road at a maximum rate of twelve miles an hour. It can climb any ordinary grade; in fact, any one that a team of horses can climb with a heavy load.



A HORSELESS FIRE ENGINE.

AN IMPROVED FRICTION CLUTCH SYSTEM.

The illustration represents a strong and simple clutch, made in sizes to positively transmit any number of horse power up to two thousand. It has been adopted, and its high efficiency is approved, by large numbers of representative users for main lines of shafting, countershafts, pulleys, dynamos, generators, motors, fire pumps, and all classes of machinery. Perhaps its strongest recommendation is its capacity for long, continuous hard service, without repairs. It is manufactured by the American Twist Drill Company, of Laconia, N. H., and has self-adjusting and centering friction disks, and the friction may be applied to pulleys on main shafts, dispensing with loose pulleys on machinery and countershafts, stopping all pulleys, countershafts and belts when dynamos or other machines are not in use. It is operated with the engine running at full speed, and will gradually start or stop any connected shafting and machinery without sudden strain upon belts or gears. Holes are drilled through all parts of the friction, that it may be quickly bolted together and converted into a solid coupling in event of any accident to the clutch mechanism. The friction surfaces are flat, and when clamped together form a vacuum, having the pressure of the atmosphere in addition to that of the levers to force them together, each part of the friction being keyed solid to the shaft upon which it runs. Simple methods of adjustment are provided, and all parts of the clutch and shafts are automatically centered when in use, there being no friction upon the shipper or shaft bearings. When the shipper sleeve is thrown out to stop the clutch, the balance weights, shown in the engraving, overcome the centrifugal force ex-



WORRALL'S FRICTION COUPLINGS PULLEYS AND GEARING.

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erted on the levers at high speeds. Any size iron or wood friction pulleys may be used for light power and moderate speed, by simply placing the pulley on one of the coupling hubs, or the friction disk may be applied direct to pulley hubs, but this plan should never be used for high speeds or heavy powers. The clutch applied to a quill upon which a pulley can be mounted, or as a cut-off coupling, will do heavy work, and may be run up to speeds of five thousand revolutions a minute.

British Strikes and Lockouts in 1895.

The annual report of Mr. J. Burnett, of the Labor Department of the British Board of Trade, on strikes and lockouts, "shows that there were 876 disputes resulting in stoppage of work during 1895, and these involved 263,758 workpeople, as against 1,061 disputes and 324,245 workpeople in 1894. As regards results, 303, or 34·6 per cent, of the disputes ended in favor of the workpeople, as against 35 per cent in 1894; but in these successful disputes 24 per cent of the persons affected during the year were involved, against 22·1 in the preceding year. The aggregate number of days lost in 1895 was 5,542,652, compared with 9,322,096 in 1894 and 31,205,062 in 1893. The average duration per head of disputes in 1895 was 21·6 days, as against 29·5 in the preceding year. The value of the aggregate number of working days lost, worked out as wages, would amount to about £1,120,000, compared with £2,000,000 in 1894. The percentage of persons concerned in the disputes of 1895 which were settled by conciliation or negotiation was 74·8, as against 56·7 in 1894."

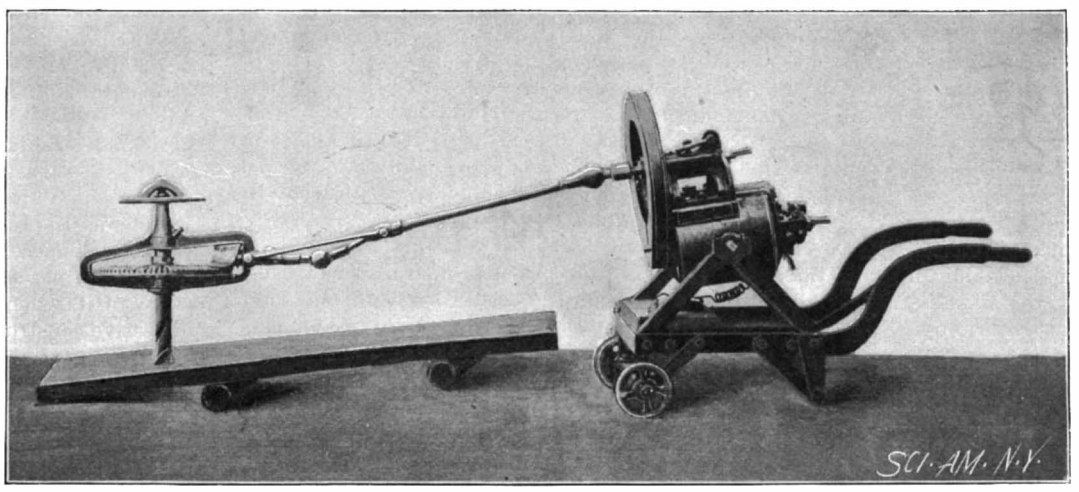
The Effect of Shading the Soil.

According to Lancaster (Ciel et Terre, March, 1896, xvii, p. 22), some experiments have been made by A. Buehler, which may be summarized as follows, says the Monthly Weather Review: Four broad plats of ground were selected, situated near each other; one was left freely exposed to the sun and wind, while the three others were shaded by horizontal wooden trellises placed around each plat and about 40 centimeters above the ground. The sunlight was cut off from the ground by the shadow of the trellis to a different extent for each plat, viz., one-quarter for plat No. 2, one-half for No. 3, and three-quarters for No. 4. In each plat, at 5 centimeters below the soil. a thermometer was buried; there was also placed in each plat an evaporometer and a vase of sheet iron filled with clay in which 1,000 grammes of water had been poured. Observations were taken every three hours, with the following results: The shaded soil experienced less cooling by radiation at night time and less warming by sunshine in the day time. The plat, No. 4, three-fourths of whose area was shaded, showed a temperature 10 per cent lower than the unshaded plat, No. 1; the lowering of temperature was most decided at noon and 3 P. M. As to the nocturnal cooling, the differences between the various plats were only 2° C. at the maximum, which explains why plants under a trellis are less exposed to frost than plants that are not thus protected. During rainy weather the differences in temperature were very small, rarely more than 1° C.; the shaded plats had a temperature a little higher than the unshaded, but during dry weather the shaded plats were warmed up more slowly. The relative evaporation from the plats was as follows: No. 1, unprotected, 100 per cent; No. 2, one-quarter covered, 88 per cent; No. 3, one-half covered, 71 per cent; No. 4, three-quarters covered, 62 per cent. Evaporation was most rapid from noon to 3 P. M. The observations all relate to a soil that is not covered with vegetation. If the soil had been cultivated, the temperature and the evaporation would have been diminished still more.

In France, wagon tires vary from three to ten inches in width, usually from four to six, depending upon the weight of the load. Were such tires compulsory in America, the present good roads movement would receive a tremendous impetus.

A PORTABLE ELECTRIC DRILLING MACHINE.

In these days of labor saving machinery there are few fields in which greater ingenuity has been shown than in the manufacture of portable machines for boring, drilling and similar shop and yard work. The great convenience of the modern portable power-driven tools has rendered them specially valuable in ship building, boiler making, and other kindred manufactures. We have been favored by Mr. F. Kodolitsch, managing director of the Austrian Lloyds Steam Navigation Company's Arsenal of Trieste, with photographs of a type of very compact portable electric drilling machine which has been at work at the Arsenal in Trieste for over three years, and has given great satisfaction. It will be seen from the illustrations that the motor, with its gearing, is pivotally suspended in a yoke, which is carried on a suitable hand truck or carriage. At the arsenal of the Austrian Lloyds Company, where 2,000 hands are employed, it is rarely that any holes are drilled with the obsolete ratchet. A network of electric wires extends over the yard, and each shop is provided with a number of special drilling machines, with the necessary electrical connections. When any holes have to be drilled in a piece of work, the portable drill is wheeled to the spot, and the wires attached. In this way the time formerly occupied in carrying the work to the drilling machine is saved.



ELECTRIC DRILL, SHOWING MOTOR, JOINTED SHAFTING AND DRILL.

As instances of the economy of these machines, we are informed by Mr. Kodolitsch that where ten flexible shaft drills were formerly used in the boiler shop, four electric boring machines now do the same amount of work, with less hands than were formerly necessary. In the fitting shop they have saved much time and money in the handling of heavy work. An instance of this occurred when a marine condenser weighing twenty-four tons was planed on one side, the necessary holes being simultaneously bored on the other side with portable drills. The seats for the air pumps were finished at the same time with a boring bar driven by one of the electric boring machines. This heavy piece was put on the planing machine as a rough casting and completely finished ready for erection before it was removed. Another instance of the handiness of these machines for special work occurred when the cast steel blades of a propeller were covered with Muntz metal sheets. Hundreds of holes had to be bored in the cast steel for receiving tap screws for holding the lining, and few of these holes were in the same direction. By the use of a drill running 180 revolutions, driven by a one horse power motor, all the holes necessary for lining one blade of a propeller eighteen feet in diameter were bored by one man and a boy in two days.

It is in the shipyard, however, that these drills have proved extraordinarily useful. In addition to the work of boring holes, they are used for countersinking, cutting out side-lights, scuttles, hawsepipe holes, boring out stern post bushes by means of boring bars, and for replacing plates out of the outside bottom of grounded ships.

The machine has also been successfully adapted for expanding boiler tubes in water tube boilers, and Messrs Yarrow & Company, of London, have several of them at work. It is stated that on actual trial where seventy tubes a day could be expanded by steam power at these works thirty tubes per hour were expanded by the use of the portable expander.

PORTABLE ELECTRIC DRILLING MACHINE AT WORK ON STEM OF LARGE STEAMSHIP.

Award of Royal Society Medals.

At the anniversary meeting of the Royal Society, the president, Sir Joseph Lister, announced, says the Electrical World, the award of the second Royal medal to Prof. Boys for his researches on measuring minute forces, by his invention of the mode of drawing quartz fibers, and by his discovery of their remarkable property of perfect elasticity. Prof. Boys used a combination of thermo-junction with a suspended coil in a galvanometer of the usual D'Arsonval type, a combination first devised by D'Arsonval himself, and by this means Prof. Boys developed the idea in the micro-radiometer, an instrument, according to Sir Joseph Lister, rivaling the bolometer in the measurement of small amounts of radiation. In the case of the Rumford medal the council made a new departure by awarding the medal in duplicate. As stated by President Lister, many physicists have studied the luminous and other effects which take place in a vacuum tube, but the extension of the field of inquiry to the external space around it is novel and most important. This extension has been due to two men—Prof. Lenard and Prof. Roentgen. Although differences of opinion exist as to the exact meaning and cause of the phenomena discovered by Lenard and Roentgen, few will dispute the theoretical interest which these discoveries embody.

The Davy medal was awarded to Prof. Henri Moissan for having accomplished the isolation of fluorine in a state of purity, and for his researches at extremely high temperatures by the aid of the electric furnace. President Lister stated that it is impossible to set bounds to the new field of research which has thus been opened out, and the electric furnace has now become the most powerful synthetical and analytical engine in the laboratory of the chemist.

Eyesight of Iron Workers.

In the mining and foundry district of Bochum, Prussia, Dr. Nieden reports having treated during the years 1885–94, 5,443 patients engaged in such occupations, of whom more than 68 per cent were cases of injury to the eye in their calling—iron and foundry workers showing a large predominance in this respect over miners. Of 3,723 iron and foundry workers treated for eye injuries, 2,805 were for the left eye and only 1,639 for the right, or a relative proportion of 56 to 44; and as a similar proportion held good in each separate year, the conclusion arrived at is that in such work the danger to the left eye is really greater than that to the right. Even more marked, in fact, was the proportion in respect to the severe cases, the left eye being quite lost in seventeen cases, the right eye in seven. It is urged, therefore, that in iron workers the loss of the right eye should be calculated as the more serious, inasmuch as the individual then runs a greater risk of injuring the remaining eye than when he has lost the left.

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Deep Waterways Commission Report.

The Deep Waterways Commission, which was appointed by the act of 1895 to make a preliminary investigation of the possibility of opening a deep waterway from the great lakes to the sea, has made a detailed report which has been forwarded to Congress by the President. In a letter accompanying the report he recommends to Congress that proper provision be made for carrying on the work of preliminary examination and that the commission be continued for the purpose of securing all necessary information.

After recounting in detail the work of the commission the report gives its conclusions seriatim as follows:

"1. That it is entirely feasible to construct such canals and develop such channels as will be adequate to any scale of navigation that may be desired between the several great lakes and the seaboard, and to conduct through the same domestic and foreign commerce, and that, in our opinion, it will be wise to provide for securing a channel of a navigable depth of not less than 20 feet.

"2. That, starting from the heads of Lakes Michigan and Superior, the most eligible route is through the several great lakes and their intermediate channels and the proposed Niagara Ship Canal (Tonawanda to Olcott) to Lake Ontario, and that the Canadian seaboard may be reached from Lake Ontario by way of the St. Lawrence River, and the American seaboard may be reached from Lake Ontario by the way of the St. Lawrence and Lake Champlain and the Hudson River, or by way of the Oswego-Oneida-Mohawk Valley and the Hudson River.

"3. That the alternative routes from Lake Ontario to the Hudson River require complete surveys and a full development of economic considerations to determine their relative availability.

"4. That a moderate control of the level of Lake Erie and of the Niagara River above Tonawanda may be justified in connection with the Niagara Ship Canal; the determination in this matter to rest on a full examination of the physical conditions.

"5. That the policy should contemplate the ultimate development of the largest useful capacity, and that all works should be planned on this basis, and that the actual execution should conform thereto, except in so far as the works may, without prejudice, be progressively developed with the actual demands of commerce.

"6. That it is practicable to develop the work in separate sections and the several sections in part by degrees, each step having its economic justification, so that benefits shall follow closely on expenditure, without awaiting the completion of the system as a whole.

"7. That the completion of the entire system as quickly as proper projects can be matured and economically executed is fully justified.

"8. That the Niagara Ship Canal should first be undertaken and incidentally the broadening and further deepening of the intermediate channels of the lakes, the same being in the logical order of development, and also requiring the least time for consideration."

The commission had neither the time nor opportunity to make a close estimate of the cost of the work. Its recommendations are summed up as follows:

"1. That complete surveys and examinations be made and all needful data to mature projects be procured for: Controlling the level of Lake Erie and projecting the Niagara Ship Canal; developing the Oswego-Oneida-Mohawk route; developing the St. Lawrence-Champlain route; improving the tidal Hudson River, and improving intermediate channels of the lakes.

"2. That the collecting and reducing of existing information, supplemented by reconnaissances and special investigations, be continued until the general questions have been fully covered.

"3. That a systematic measurement of the outflow of the several lakes and a final determination of their levels shall be undertaken.

"4. The complete surveys and investigations, with measurements of the outflow of the several lakes and full investigation of collateral questions, will cost not less than $600,000 and require some years of time.

"It is probable that the measurement of the outflow of the lakes and the final levels can be as well done through some other agency, and this item may be taken at $250,000, to be expended through a series of years, and this should be at once undertaken, on account of the prevailing low water of the lake system, which cannot be expected to continue.

"The specific surveys and investigations are in themselves estimated at $350,000, and will take two or three years, and of this not less than $150,000 should be appropriated the first year, along with such additional sum as may be required for measuring the outflow of the lakes, of which $100,000 should be made available during the first year."

The Canadian government, which is also deeply interested in the question of opening a deep waterway to the sea, had appointed a commission to look into the question; and a joint session of the two commissions was held at Detroit early in 1896, when the ship owners and masters who were gathered at the annual meeting of the Lake Carriers' Association gave much valuable information.

Recent Patent and Trade Mark Decisions.

Tarrant & Company v. Johan Hoff (U. S. C. C. A., 2d Cir.), 76 Fed., 959.

Infringement of the Trade Mark "Hoff's Malt Extract."—In this case Tarrant & Company obtained the right to manufacture and sell "Johan Hoff's Malt Extract" in the United States under labels and trade marks used in Germany for many years, and which entered into commerce under the name of "Hoff's Extract." The defendant, Johan Hoff, became the agent in the United States for a malt extract made in Germany by Leopold Hoff. He used the words "Hoff's Malt Extract" on his labels and advertisements, affixing, however, a perpendicular side label with the words "Manufactured by Leopold Hoff." It was held that the defendant had no right to use the words "Hoff's Malt Extract" unless it was preceded by the word "Leopold" in a conspicuous place, and that the perpendicular side label was not sufficient to prevent the deception of the public.

False Statement in Labels.—While false representations in a label will prevent a manufacturer using such labels from being enjoined because of the infringement, such, however, is not the case where the statements, while not strictly accurate, are entirely immaterial.

P. H. Murphy Manufacturing Company v. Excelsior Car Roof Company (U. S. C. C. A., 8th Cir.), 76 Fed., 965.

Metal Car Roof.—The Murphy patent, No. 414,069, for an improvement in car roofs, has been held not to be infringed by the Jennings patent, No. 446,780, on the ground that the "angle strip," which is the chief element of all the combinations in the former, is omitted from the latter.

Limitation of Claims.—A patent to one who has made a slight improvement on devices that perform the same function before as after the improvement is protected against those only which use the very improvement he claims, or mere colorable evasions of it.

"Foreign Art."—The art of covering the roof of a car with sheets of metal is so nearly, if not completely, identical with that of covering a house with the same material, that there could be no invention in using one for the other, unless some radical modification was required to adapt it to the new use.

Mechanical Equivalents.—The "angle strips" in the Murphy patent, No. 414,069, is a copy of the metal ribs in the Hawthorne patent, No. 386,316, and the mechanical equivalent of the triangular strips in the Smith patent, No. 143,471, the ribs of wood in Morsell's patent, No. 165,113, and the bars of metal in Naylor's patent, No. 1,321.

Omission of an Element of a Combination.—The unquestioned rule is that the absence from a device alleged to infringe of a single essential element of a patentable combination of old elements is fatal to the claim of infringement, and where the patentee introduces an element into each of his claims and makes it the first element, it cannot be eliminated in construing the claims.

Campbell v. Richardson (U. S. C. C. A., 3d Cir.), 76 Fed., 976.

Garment Hooks.—The De Long patent, No. 462,473, is limited by the words "substantially as described" to the form of hooks shown and described, that is, one in which the free end of the wire is carried to "the rear end of the shank and there formed into an eye," giving to the hook three eyes by which to attach it instead of two, as formerly.

Construction of Claims.—Where a claim contains the words "substantially as described," and such claim in its terms is old, but the part of the device to which such claim relates, as shown and described, is new, the claim should be construed, by reason of the phrase "substantially as described," to cover the invention described, unless that would conflict with the terms of the claim. The fact that such construction of the claim makes it coterminous with the other claims in the patent is immaterial, for that is a fault in the language of the claims, and similarity of claims in a patent is not unusual.

Brunswick-Balke-Collender Company v. Phelan Billiard Ball Company (U. S. C. C. N. Y.), 76 Fed., 978.

Pool Ball Frames.—Patent No. 288,879 for a pool ball frame, with rounded corners made with layers of wood bent in a triangular shape, has been held to be void, because it required nothing more than mere mechanical skill.

Foster v. Wertheimer (U. S. C. C. N. Y.), 76 Fed., 979.

Glove Fastener.—The Foster patent, No. 279,980, has been construed and held valid as to the exact combination shown.

What Amounts to a Patentable Difference.—In this case it was held that an improvement in the glove fastener, consisting of the rearward extension and elevation of the head and neck of a former device, by means of which the tightening of the glove is made easier, the fitting more perfect, and the fastening more secure, amounts to a patentable difference. While the size of these parts is so small that the differences seem very little, yet the change in the mode and effect of the operation of the parts is quite considerable.

Infringement.—The defendant's fastener contained the features of the plaintiff's improvement in the same relation to each other, but in somewhat different form, except that the front of the head and the glove material were brought close together by raising the plate below instead of inclining the head above, so that in operation and effect the parts are the same and infringe.

Independent Electric Company v. Jeffrey Electric Manufacturing Company (U. S. C. C. O.), 76 Fed., 981.

Mining Machine.—The Lechner patent, No. 432,754, for a mining machine, which combines a traveling frame, an endless belt cutter, an auxiliary cutter operating in a different plane, and a holding projection adapted to follow such auxiliary cutter into the incision made thereby and to form a holder to operate against the thrust or force of the band cutter, has been held valid and infringed as to its first claim.

Effect of Impracticability on the Validity of a Patent.—The mere fact that a machine constructed on the lines of a patent was a failure does not affect the validity of it, when it appears that the failure was due to defective construction, not to the peculiar improvement patented, and that successful machines were afterward made.

Assignment of Future Inventions.—Where a patentee conveys an interest in his patent and any and all improvements which he may thereafter acquire or invent in connection with and in any way appertaining to the improvement patented, the assignee thereby acquires no interest in a subsequent invention for a distinct machine which works on a principle radically different from that of the former patent.

Contract to Assign Future Inventions.—Where an inventor agreed to convey an interest in several inventions and in any improvements thereon made in the future and in the patents for such improvements, and afterward another agreement was made in writing whereby such assignee was to have an interest in certain patents, nothing being said about improvements, and a suit was brought for a specific performance of the latter agreement, it was held that the rights of such party under the two agreements were merged in the decree and he had no claim under the contract to any future patents or improvements.

Dedication of Invention to the Public.—Where applicant for a patent shows an improvement but does not claim it, and before the patent was issued another application was filed by the same inventor in which he claims such invention, the presumption that what is shown or described in the patent and not claimed therein is dedicated to the public, does not arise.

Owen v. Ladd (U. S. C. C. Conn.), 76 Fed., 992.

Gong Bell.—The Owen reissue patent, No. 10,348, for a gong bell having in combination the novel element of a curved and bent vibrating standard, if valid at all, has been held not to be infringed by a gong in which the standard is neither curved nor bent, and is cast solid with the base.

Delay in Suing for Infringement of Patent.—The delay of over ten years in bringing suit, after charging infringement and it being denied, is such laches as to prevent recovery against one who in the meantime succeeded to the alleged infringing business.

England, America and the Metric System.

British and American consuls agree in reporting that the foreign trade of their respective countries would be greatly benefited by the adoption of the metric system of weights and measures, says the European edition of the New York Herald. With the exception of England and Russia, all European nations use the system; and, in view of the convincing testimony taken by the committee of the House of Commons last year, its adoption by England at an early day seems probable. The United States years ago legalized the use of metric weights and measures, but did nothing to enforce their use. Just now her merchants are working to increase their trade with the countries of Central and South America, and as all these use the metric system, there is a growing pressure for its formal adoption by Congress. The House of Commons committee asserted that the use of the metric system would save one year's schooling of all the children in the United Kingdom, and houses engaged in foreign trade testified that its adoption would enable them to get on with fewer clerks. In America the local weights and measures used in the various States are particularly numerous and confusing, and the substitution of the uniform French system for all of these would be of inestimable benefit.

ACCORDING to Engineering, some recent researches by Captain Abney show that the light of the starry sky is to that of the full moon about as 1:44,000. The latter is usually considered to be about as 1:600,000 to that of the sun at noon, so that we receive over 13,000,000 million times as much light as from the stars, taking both hemispheres into consideration.

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Correspondence.

Half Century Readers of the Scientific American.

To the Editor of the SCIENTIFIC AMERICAN:

If the following is of interest to you, you are at liberty to use it as you may wish.

When a young man in my twentieth year I was bookkeeper in one of the largest manufacturing establishments in our city, and was so interested in your paper that I asked our workmen to subscribe and sent you their names. About that time I was librarian in the Mechanics' Library, thus bringing me in contact with many mechanics. I then began, as a young man, to take your paper and have continued a subscriber ever since, now fifty-one years. Have you an older one?

CHARLES W. JENCKS.

Providence, R. I., February 4, 1897.

To the Editor of the SCIENTIFIC AMERICAN:

This is the commencement of my fifty-first year's reading of the SCIENTIFIC 'AMERICAN. When I first met him, he was quite a little fellow, but, in wisdom and knowledge, far beyond his years. Now he is the most fully developed giant in the arts and sciences the world has yet produced. What will he be by the end of the next century? Who can answer?

I inclose money order for $3, to renew my subscription.

J. R. MABEN.

Bedford Springs, Va., January 1, 1897.

Another correspondent writes: "I believe I have all or nearly all the numbers since the first issue in 1845. My brother, who died in 1858, was a subscriber from the beginning. After his death I continued it, with some intermissions during my absence in California and during the war. I, however, always sent for back numbers and in that way have complete files."

[The letters printed herewith, touching the much mooted question as to the oldest living subscriber, have been received by us in our ordinary mail. We are not able to determine the question of priority, owing to the destruction of our books in the great Park Row fire in 1882. The subject is evidently one of interest to our readers, and it is a curious coincidence that the three letters printed above should have been received by us at almost the same time without suggestion or solicitation on our part.—ED.]

Agriculture for a Year.

The annual report of Mr. J. Sterling Morton, Secretary of Agriculture, has been received, says the American Manufacturer.

It appears that since March 7, 1893, the civil service regulations have been extended until they now include "every important permanent position in the United States Department of Agriculture." "This department," says the secretary, "has for its object the discovery, investigation, development and utilization of the agricultural resources of the United States. Primarily it is a scientific or technical department." The secretary rightly says that the functions of this department have little or no relation to political policies or expedients. Its useful work should go ahead year after year systematically. There are now on the pay rolls of the department 2,217 men and women, a reduction of the force of 280 since 1893, in spite of the fact that the work has increased. This reduction was made possible, Secretary Morton says, because of the improvements effected by the law extending the classified civil service.

"The bureaus and divisions in Washington," the report continues, "are, contrary to the popular idea, much the smaller part of the Department of Agriculture. Outside of Washington there are 154 observing stations and 52 signal stations of the Weather Bureau. There are 152 meat inspection stations in the country; 21 different quarantine stations, for import cattle at points on the coast, the Canadian and Mexican boundary; 9 different stations for inspecting import stock and 19 for inspecting stock for Texas fever, making a total of nearly 200 stations in the Bureau of Animal Industry, which should have inspection and supervision occasionally by the highest authority of the department. The agricultural experiment stations, located in different States and Territories, and several experiment stations of the Department of Agriculture, must be inspected by this department. In addition to these the department has many other agencies for studying soils, foods and food dietaries, testing timbers and collecting material, illustrating our natural resources scattered all over the country."

The secretary advises that an additional executive officer shall be employed, who shall have general supervision of all the work of the department. This officer should be, the secretary says, "a broadly educated, scientific man." He also calls attention to the fact that the salaries of the higher officials in the department are at present inadequate, young men being drawn away from the government service constantly to accept higher salaries offered by universities, colleges and scientific schools.

"Agricultural colleges and experiment stations are teaching the science of agriculture," the report continues, "but they are not generally teaching farm economics and the importance of markets." With this latter end in view, Secretary Morton organized on March 20, 1894, the "Section of Foreign Markets," one of whose admirable publications, relating to Sweden, was noticed in the last number of the Manufacturer. This section not only publishes a regular series of bulletins and circulars, but it furnishes information in response to special inquiries.

The secretary is of the opinion that the distribution of seeds to applicants is a wasteful expenditure on the part of the government, and he is certainly not alone in this view. The report says: "The seeds distributed gratuitously by the government during the fiscal year closing on the 30th of June last weighed a little over 230 tons. The cost of carrying them through the mails was over $70,000. They occupied 30 mail cars in transportation. Careful computation shows that the seeds sent out by the Department of Agriculture during the year would have planted 21,038 acres of cabbage, 10,768 acres of lettuce, 10,712 acres of tomatoes, and other garden vegetables in proportionately large areas. Briefly, the seed gratuitously sent about the country would have planted more than 115 square miles of garden. In other words, it would have planted a strip of ground one rod in width and 36,817 miles in length. Such a strip would reach one and a half times around the globe, and a passenger train going at the rate of 60 miles an hour would require 51 days 3 hours and 14 minutes to travel from one end of this gratuitously seeded truck patch to the other. Each congressional quota contained seed enough to plant more than 163½ acres."

Mr. Morton concludes his report as follows: "The question for American farmers and all other citizens engaged in gainful occupations to consider is: How can the United States supply the markets of the world with staple food product and necessary articles of manufacture? . . . It is probably quite safe to declare that at least 2,000,000 of American workmen, on farms and factories, subsist almost wholly upon employment based upon foreign demand for American commodities. And in this contest for feeding and furnishing mankind—notwithstanding the fierce competition which meets us all over the globe—American agriculture, manufacture and commerce are steadily gaining more trade, and thus furnishing an enlarged wages fund on a gold basis out of which many thousands of American laborers and skilled artisans draw their yearly remuneration, and upon which they and their families largely depend for employment and comfort."

Footwear Nevers.

Dr. Samuel Appleton, in Health Culture, gives fourteen of them, which every person will derive comfort in heeding:

1. Never wear a shoe that will not allow the great toe to lie in a straight line.
2. Never wear a shoe with a sole narrower than the outline of the foot traced with a pencil close under the rounding edge.
3. Never wear a shoe that pinches the heel.
4. Never wear a shoe or boot so large in the heel that the foot is not kept in place.
5. Never wear a shoe or boot tight anywhere.
6. Never wear a shoe or boot that has depressions in any part of the sole to drop any joint or bearing below the level plane.
7. Never wear a shoe with a sole turning up very much at the toes, as this causes the cords on the upper part of the foot to contract.
8. Never wear a shoe that presses up into the hollow of the foot.
9. Never have the top of the boots tight, as it interferes with the action of the calf muscles, makes one walk badly and spoils the shape of the ankle.
10. Never come from high heels to low heels at one jump.
11. Never wear one pair of shoes all the time, unless obliged to do so. Two pairs of boots worn a day at a time alternately give more service and are much more healthful.
12. Never wear leather sole linings to stand upon. White cotton drilling or linen is much better and more healthful.
13. Never wear a short stocking, or one which after being washed is not, at least, one-half inch longer than the foot. Bear in mind that stockings shrink. Be sure that they will allow your toes to spread out at the extreme ends, as this keeps the joints in place and makes a strong and attractive foot. As to shape of stockings, the single digital or "one-toe stocking" is the best.
14. Never think that the feet will grow large from wearing proper shoes. Pinching and distorting makes them grow not only large but unsightly. A proper, natural use of all the muscles makes them compact and attractive.

THE elevation of Sir Joseph Lister to the peerage has been received with great satisfaction by the scientific world, and is an honor not only to his profession but to the Royal Society as well.

Science Notes.

Sir Joseph Lister on being raised to the peerage has selected the title of Lord Lister.

Physiological uses of the Roentgen rays have so increased that the publication of the Archives of Clinical Skiagraphy has been begun in London.

We learn from Natural Science, of London, that the Roentgen rays have been applied to fossils embedded in chalk, and the photographs obtained have been very successful.

Heinrich Gätke, who, in fleeing from Prussian political persecution in 1848, was wrecked on Heligoland, and spent the rest of his life there, marrying a native, painting marine views, and watching the flights of birds over the island, has just died at the age of 83. His collection of migratory birds is in the South Kensington Museum. He held the place of government secretary until the English gave up Heligoland.

The Bressa prize of the Royal Academy of Sciences of Turin will be awarded in 1899. The value of the prize is nearly $2,000. It will be given for the most important scientific work produced during the years 1895–98. The term will be closed at the end of December, 1898. The competitors must send their contributions in print before the above stated time. The prize may, however, be awarded to a non-competitor if he is considered the most worthy to receive it.

The following are the calculated illuminating values of mantles made from the oxides named per cubic foot of gas: Thoria (commercial) 6·0; thoria (pure) 1·0; zirconia (commercial) 3·10; zirconia (pure) 1·5; ceria, 0·9; yttria, 5·2; lanthania, 6·0; erbia (commercial) 1·7; erbia (pure) 0·6; alumina, 0·6; chromium oxide, 0·4; barium oxide, 3·3; strontia, 5·5; magnesia, 5·0. Ceria gives a reddish-yellow light. Erbia, zirconia, and oxide of barium, a yellow light. Alumina, a whitish yellow. Strontia and magnesia, a white light.

Austria proposes to introduce radical innovations into its university systems. Students' fees are to go to the government instead of to individual professors, while professors' salaries throughout the empire are to be equalized. Moreover, well known professors are to be distributed among the provincial universities instead of being retained at centers like Vienna and Prague, in order to check the flow of provincial students to the great cities. The result will be the establishment of a system of higher instruction, somewhat resembling that in American colleges. Objection is made to the scheme on the ground that it interferes with the German theory of Lehr and Lern-freiheit, and that it gives the government too much power over the higher education.

The Department of Agriculture has detailed Prof. H. J. Webber, of Eustis, Fla., to make an investigation of the plant known as the water hyacinth, which has come so near blocking navigation in the St. John's River tributaries. Until last September little attention had been paid to the steady increase in the growth of the water hyacinths on the St. John's River. At that time a member of the Jacksonville Times-Union staff made a trip up the river, and at once began calling attention to the obstruction to navigation of the river by the hyacinths. Since that time the matter has been taken up by the War Department and the Agricultural Department, and it now looks as though something might be done to rid the river of the plants.

Two Danish officers, MM. Oloufsen and Philipsen, have just arrived in St. Petersburg on their return from a journey of exploration to the Pamir country, where they reached places hitherto untrodden by Europeans. They met tribes who are still fire worshipers and totally uncivilized. The men of these tribes and even their animals are very small, the bulls and cows being no larger than a European foal, the donkeys about the size of a large dog, and the sheep about as large as a small poodle. Money is unknown to them, and their only trade consists in the bartering of furs. Women are bought at the rate of five or six cows or fifteen sheep apiece. These natives are very timid. MM. Philipsen and Oloufsen have secured numerous scientific collections, which they intend presenting to the Natural History Museum in Copenhagen.

According to Dr. W. O. Atwater, of Wesleyan University, in 25 cents' worth of various foods there are the following nutritive values in each: In 10 pounds of cornmeal there are more than 8 pounds of actual nutriment; in 8⅛ pounds of wheat flour there are over 6¾ pounds of nutriment; in 5 pounds of white sugar there are 4½ pounds of nutriment; in 5 pounds of beans there are 4 pounds of nutriment; in 20 pounds of potatoes there are 3¾ pounds of nutriment; in 25 cents' worth of fat salt pork there are 3½ pounds of nutriment; in the same value of wheat bread there are 2¼ pounds; in the neck of beef 1¾ pounds; in skim milk cheese 1¾ pounds; in whole milk cheese more than 1½ pounds; in butter 1½ pounds; in smoked ham and leg of mutton about the same; in milk over 1 pound; in mackerel about 1 pound; in round of beef ¾ pound; in salt codfish and beef sirloin about ½ pound; in eggs at 25 cents a dozen about 7 ounces; in fresh codfish about 6 ounces, and in oysters at 35 cents a quart about 3 ounces.

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THE HARLEM RIVER SPEEDWAY, NEW YORK CITY.

(Continued from page 90.)

In estimating the value to the driving, and in these days it should be added the bicycling, public of the Harlem River Speedway, it must be borne in mind that it forms, as mentioned in a preceding article, the connecting link in a circular driveway, whose other portion is of greater length and, if possible, enriched with features of greater historic and natural beauty. It has been mentioned that the new speedway terminates at Dyckman Street, into which it leads. The latter thoroughfare, which has a clear width of 100 feet, runs northwesterly to an intersection with Kingsbridge Road, which forms the continuation of the famous Boulevard to the south of it. It is here that the new Boulevard Lafayette, which constitutes the western portion of the drive, commences. As finally completed it will have a clear width of 100 feet for the whole of its length from the Kingsbridge Road to One Hundred and Fifty-seventh Street — a distance of three miles. From the Kingsbridge Road the Boulevard rises on a regular grade and winds around the northern spur of Washington Heights, until it reaches the bluffs of the Hudson at a high elevation above the river. The roadway is largely blasted out from the cliffs and in many places is carried by heavy retaining walls. This lofty elevation opens out a charming and ever changing panorama of Hudson River scenery, extending from the far distant and softly outlined hills of New Jersey in the south to the wooded heights that raise their heads above picturesque Tarrytown far to the north. The new Boulevard terminates at Eleventh Avenue and One Hundred and Fifty-seventh Street, from which point the entrance to the Harlem Speedway is reached by way of One Hundred and Fifty-fifth Street. By the time he has arrived at the starting point, the horseman will have covered nearly six miles of what may be justly termed one of the most handsome and picturesque driveways in the world.

From the above description it will be seen that this magnificent system of roads makes the complete circuit of the spur of lofty land at the northern end of Manhattan Island which is known as Washington Heights. We have referred to the historical associations which cluster thickly around its colonial mansions and tell their story from many a grass-grown rifle pit and weatherbeaten fort. Here was the favorite site for the summer residences of notable colonial families. Conspicuous among them is the mansion known as Washington's Headquarters, which is built on a lofty eminence overlooking the Harlem River and not far from the southern entrance to the Speedway. Crowning the projecting headland just above the junction of the Speedway with Dyckman Street is Fort George, which figured conspicuously in the operations of the revolutionary war: and across the heights to the westward, on a spur of land which runs out into the Hudson about midway of the length of Lafayette Boulevard, is Fort Washington, where, owing to the culpable blundering of Washington's subordinate generals, the revolutionary cause suffered one of the greatest disasters of the war. Above the avenue are to be found such historic homes as the Jumel mansion, noted as the residence of Aaron Burr; the Morris mansion; the Monroe mansion, and many another colonial building which bears a name less famous it may be than these, but destined to be forever conspicuous on the pages of our national history.

Our detailed description of the Speedway in the last issue included the first section of the work, and carried us to High Bridge. At this point the surveyors found it necessary to narrow the roadway to a width of 66½ feet, in order to pass between the piers, and to carry the westerly sidewalk round the outside of the adjoining pier, and at a higher elevation than the roadway. Just beyond the bridge is located the second subway for foot passengers, for communication between the east and the west sidewalks without crossing the drive, and at this point walks will be constructed leading to the High Bridge Park. After passing beneath the bridge, the roadway widens to 75 feet and holds this width to within 500 feet of Washington Bridge, where it gradually narrows down to 55 feet, in order to pass to the eastward of the bridge pier. This is the narrowest portion of the whole Speedway, and it will naturally be a source of regret that the bulkhead could not have been carried 10 feet further into the river. As it is, however, the roadway extends 15 feet beyond the bulkhead lines established by the government, and this was the maximum allowance that could be obtained from the War Department, who are naturally anxious to maintain the full width of a waterway which, now that the Harlem Canal is opened, has a high strategic as well as commercial value, giving access from the Hudson to the East River independently of the route by the Battery.

THE HARLEM RIVER SPEEDWAY—VIEW LOOKING SOUTH FROM DYCKMAN STREET BEFORE COMMENCEMENT OF WORK.

VIEW OF THE SAME SPOT SHOWING WORK COMPLETED.

Immediately north of Washington Bridge is located the third subway. Owing to the fact that the westerly walk is carried to the west of the pier of the bridge, at an elevation of 26 feet above the roadway, there is a rise of 33 feet from the floor of the subway to the sidewalk. To obtain as easy a rise as possible, the connecting stairway will be built with a broad, easy curve, and for landscape effect the sloping ground between stairway and sidewalk will be terraced and laid out in flower beds and shrubbery. Judging from the plans of this work, it promises to be a highly ornamental feature of the driveway.

By reference to the large front page engraving, which is taken from the top of Washington Bridge, an excellent idea will be obtained of this portion of the work. To the left will be seen the westerly walk, which here falls on an even grade to the roadway, which is reached near the end of the great side hill cut. The retaining wall is built of broken range masonry, as is also the retaining wall seen to the west of the walk against the bluffs, which has been built to catch the heavy drainage and the loose material which is carried down where the soil is loose and liable to slide. The line of the coping has been broken in order to avoid a too stiff appearance, and trailing vines are to be planted against this and all retaining walls, so as to make them harmonize as far as possible with the general appearance of the bluffs.

Eight hundred feet beyond the bridge the roadway widens out to 95 feet, and the planting spaces, which have been omitted between the bridges, again make their appearance, and are continued to the end of the drive. By reference to the illustration, it will be seen that one of the stretches of masonry bulkhead has been built where the roadway has been blasted out of a projecting bluff. The white stone work and the dark strip of asphalt paving indicate the length of this work. The inclined westerly walk is to be similarly asphalted.

It is just at this point that the most costly piece of excavation on the whole driveway occurs. The center line length of the cut was over 1,000 feet, and the top of the slope is 110 feet above the roadway grade. As over 160,000 cubic yards of material were taken out at a contract price of $1.20 per yard, this inconveniently obtrusive point of rock has cost the city $192,000 to remove. North of the cut the roadway extends on a straight course to the mouth of Sherman Creek, where it swings to the left with an easy curve and merges into Dyckman Street. This part of the work consists chiefly of filling, and the bulkheads are built of cribwork.

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Two of the accompanying illustrations show the condition of this portion of the driveway before construction was commenced and after the filling was completed. They are reproduced from photographs taken from exactly the same point of view, and portray, better than any pen can describe, the transformation that has been effected. In the later cut the point of view is exactly in the center of the westerly sidewalk. The broad strip of garden mould between the sidewalk and the roadway, which shows up in the photograph of a darker shade than the surrounding material, marks the location of the masonry trench for tree planting, the construction of which was explained in the previous article.

The track which is seen to the right of the picture is being used in filling in the bays of the creek which lie between the drive and the shore. This work is part of an important modification of the original plans, which will add greatly to the appearance of the finished Speedway. It was at first intended to allow such portions of the tideland as might be inclosed between the drive and the shore line to remain as they were. This would have left a series of unsightly holes which would have been a blemish upon the work and a continual eyesore. The present Park Board very wisely determined to fill in all such spaces to the grade level and give them landscape treatment. They will be planted with trees and laid out with winding walks, and will form a park-like border to the drive, which will extend over a considerable part of its length.

The total quantities for the second section of the work, as given by Mr. J. A. Lockwood, the engineer in charge, to whose courtesy we are indebted for all particulars, are as follows: The excavation, mostly solid rock, shows a total to date of 281,000 yards. There are 350,000 yards of filling, and this is held in place by no less than 3,750,000 cubic feet of cribwork. The masonry retaining walls account for 12,000 cubic yards of broken range masonry, and there are 30,000 yards of first-class masonry in the bulkheads and subways.

By the time it is opened to the public the Speedway will have cost about $2,250,000, of which $1,932,000 have been expended to date. The second section will be completed early this spring, and as about twelve months will be consumed in finishing up the work on the first section, we may look for the opening of the Speedway early in the spring of next year.

THE HARLEM RIVER SPEEDWAY—LAYING CONCRETE FOUNDATION FOR ASPHALT ON THE EASTERLY SIDEWALK.

Flowers in Sick Rooms.

After relating several anecdotes of cases where flowers have proved injurious when kept in the bedroom of invalids, The Hospital says: "It is not necessary to comment at length upon cases like these. They tell their own story, and point their own moral. The rule should be that, where flowers are kept in bedrooms, they should be changed frequently, and those which yield a heavy odor should not be preserved after the day is over. In sitting rooms the case is somewhat different; but even in them flowers should not be kept more than a few days, and the vases in which they are placed should be well washed out with hot water once or twice a week."

THE STABILITY OF THE BATTLESHIP INDIANA.

It will be remembered that the new battleship Indiana, on a trip from Hampton Roads to New York harbor last October, rolled so heavily as to break loose all the heavy guns and turrets. The enormous momentum of the great masses of metal proved too much for the clamps which prevent the turrets from rotation on their turntables, and, tearing loose, the guns began to swing to and fro across the decks with every roll of the ship. In the height of the gale the crew set to work to lash the guns temporarily in place, and the story of that never-to-be-forgotten night, as told by Capt. Evans, will bear repetition just now, when the Indiana has again had to return to port lately from fear of a similar accident.

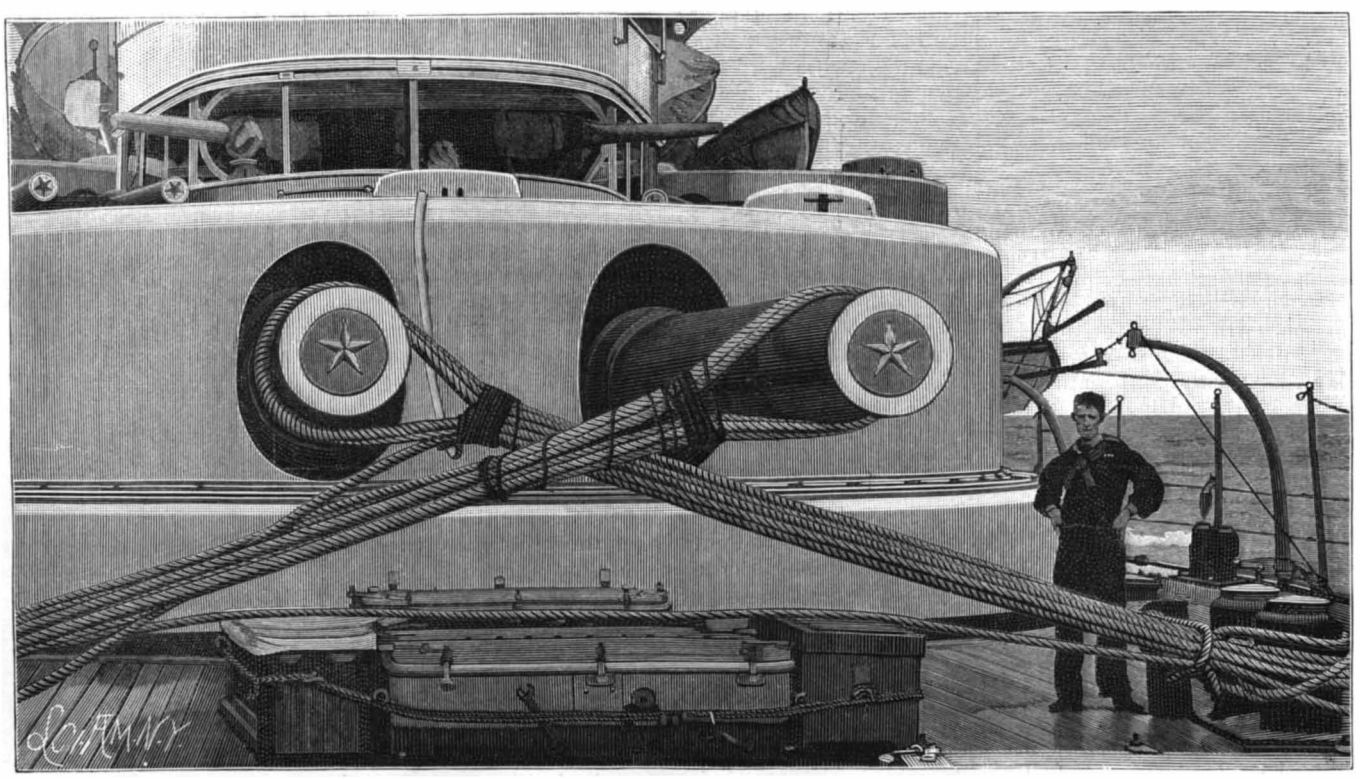
"We tied the two forward guns together by binding the guns each to the other and fastening the hawsers to the bitts, and managed the aft ones the same way. It was a very hard job. About two o'clock next morning the forward ones snapped their hawsers and got loose again. The storm was then very severe, and the ship was rolling at an angle of 36 degrees. To make matters worse, the forward 13 inch guns got loose, and those enormous guns began thrashing about in full command of the deck. We finally caught the big guns with a 13 inch hawser and tied them securely to the superstructure."

On the morning after the storm one of the electricians, with the permission of Capt. Evans, took a photograph of the aft pair of 13 inch guns, from which the accompanying engraving has been prepared.

It will be seen that the 8 inch hawser was passed around the chase of the gun, a few feet from the muzzle, and led around the bitts on the opposite side of the deck, the operation being repeated until a sufficient number of turns had been taken to hold it securely. Any one who has handled an 8 inch manila hawser can well believe Capt. Evans when he says: "It was very dangerous in that storm. I was afraid of losing two or three dozen men, and if I had not had the best crew in the world, I don't know how we would have come out."

Upon the return to the navy yard stronger clamps were put in place, such as, it was supposed, would stand any possible demands upon them. It seems, however, that the Indiana has again had to leave Admiral Bunce's squadron and put back, not this time because the turrets actually did break loose, but for fear they would. In a report given out by the Navy Department, it is stated that the return of the ship was due to the "caution" of the officers and a desire for "a further inspection and possible readjustment." The excessive rolling of the Indiana is ascribed to the fact that she is not fitted with the bilge keels which she was designed to have. These were omitted because the naval docks were not of sufficient capacity to accommodate the ship with bilge keels in place.

It is gratifying to learn that the rolling of the Indiana and her class is not, in the minds of the naval experts, due to their top hamper and the great height (26 feet) at which the four 8 inch guns and turrets are carried. When the designs were published, it was predicted in many quarters that these ships would not show sufficient stability in a beam sea, and the performance of the Oregon in Pacific waters coupled with the troubles of the Indiana might seem to verify the prediction. Against this, however, it is quite sufficient to reply that the most stable ships of foreign navies showed quite as great instability before their bilge



BATTLESHIP INDIANA—THE BIG GUNS LASHED, AFTER BREAKING LOOSE DURING A GALE.

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keels were fitted. This is notably true in the case of the Resolution, a 14,150 ton ship of the British navy, which, in crossing the Bay of Biscay, rolled 47 degrees, and looked so much like "turning turtle" that she put back to Plymouth. Bilge keels were fitted, and she is now one of the steadiest ships afloat.

The bilge keels are continuous, narrow, plate steel, V-shaped keels, about three feet deep, that extend at the turn of the bilges for the greater part of the length of the ship. Their broad surface, by its resistance, prevents the rolling of the ship, hence their other name of rolling keels.

A Convenient Metric Conversion Table.

The following metric conversion table has been compiled by Mr. C. W. Hunt, M. Am. Soc. M.E., president of the C. W. Hunt Company, of New York City, and is most convenient in dealing with metric weights and measures:

Millimeters × 0·03937 = inches.
Millimeters ÷ 25·4 = inches.
Centimeters × 0·3937 = inches.
Centimeters ÷ 2·54 = inches.
Meters × 39·37 = inches. (Act of Congress.)
Meters × 3·281 = feet.
Meters × 1·094 = yards.
Kilometers × 0·621 = miles.
Kilometers ÷ 1·6093 = miles.
Kilometers × 3280·7 = feet.
Square millimeters × 0·0155 = square inches.
Square millimeters ÷ 645·1 = square inches.
Square centimeters × 0·155 = square inches.
Square centimeters ÷ 6·451 = square inches.
Square meters × 10·764 = square feet.
Square kilometers × 247·1 = acres.
Hectares × 2·471 = acres.
Cubic centimeters ÷ 16·383 = cubic inches.
Cubic centimeters ÷ 3·69 = fluid drachms. (U. S. P.)
Cubic centimeters ÷ 29·57 = fluid ounce. (U. S. P.)
Cubic meters × 35·315 = cubic feet.
Cubic meters × 1·308 = cubic yards.
Cubic meters × 264·2 = gallons (231 cubic inches).
Liters × 61·022 = cubic inches. (Act of Congress.)
Liters × 33·84 = fluid ounces. (U. S. P.)
Liters × 0·2642 = gallons (231 cubic inches).
Liters ÷ 3·78 = gallons (231 cubic inches).
Liters ÷ 28·316 = cubic feet.
Hectoliters × 3·531 = cubic feet.
Hectoliters × 2·84 = bushels (2150·42 cubic inches).
Hectoliters × 0·131 = cubic yards.
Hectoliters ÷ 26·42 = gallons (231 cubic inches).
Grammes × 15·432 = grains. (Act of Congress.)
Grammes × 981 = dynes.
Grammes (water) ÷ 29·57 = fluid ounces.
Grammes ÷ 28·35 = ounces avoirdupois.
Grammes per cubic centimeter ÷ 27·7 = pounds per cubic inch.
Joule × 0·7373 = foot pounds.
Kilogrammes × 2·2046 = pounds.
Kilogrammes × 35·3 = ounces avoirdupois.
Kilogrammes ÷ 1102·3 = tons (2,000 pounds).
Kilogrammes per square centimeter × 14·223 = pounds per square inch.
Kilogrammeters × 7·233 = foot pounds.
Kilogrammes per meter × 0·672 = pounds per square foot.
Kilogrammes per cubic meter × 0·062 = pounds per cubic foot.
Kilogrammes per cheval vapeur × 2·235 = pounds per horse power.
Kilowatts × 1·34 = horse power.
Watts ÷ 746 = horse power.
Watts ÷ 0·7373 = foot pounds per second.
Calorie × 3·968 = B. T. U.
Cheval vapeur × 0·9863 = horse power.
(Centigrade × 1·8) + 32 = degrees Fahrenheit.
Francs × 0·193 = dollars.
Gravity, Paris = 980·94 centimeters per second.

Rise and Decline of Strikes.

A record of strikes in the United States for 1881–86, from the United States Bureau of Labor Statistics, has been supplemented by a report bringing the record down to 1894. The former record showed a great increase of strikes, culminating in 1886 with the riots and Haymarket massacre at Chicago. The following totals for the period covered by both reports are tabulated and commented upon by the Springfield Republican:

	Strikes.	Establishments.	Number thrown out of work.	Per cent which failed.
1881	471	2,928	129,521	31·63
1882	454	2,105	154,671	38·24
1883	478	2,759	119,763	25·74
1884	443	2,367	147,054	44·61
1885	645	2,284	242,705	37·70
1886	1,432	10,053	508,044	46·58
1887	1,436	6,589	379,676	47·17
1888	906	3,506	147,704	42·30
1889	1,075	3,786	249,559	34·60
1890	1,833	9,424	351,944	37·34
1891	1,717	8,116	298,939	53·83
1892	1,298	5,540	206,671	51·99
1893	1,305	4,555	265,914	38·79
1894 (6 months)	896	5,154	482,066	60·51

"It will be observed that, after 1886, strikes, taking the number of establishments involved, decreased in prevalence until 1890, when there was a sudden increase to almost the extent of 1886 over 1885, and another decline followed by the widespread disturbances of 1894 which culminated, as in 1886, in the Chicago railway riots. The two years of 1886 and 1894 stand out above all the others, both in the number of establishments involved and the number of workmen thrown out of employment; but the causes were different. The former year witnessed a revival of business activity from the depression of 1884 and the strikes were generally for increase in wages. In 1894, however, we had very hard times and strikes against wage reductions.

"But the most instructive and significant figures of the table are those exhibiting the proportion of establishments involved in which the strikes failed altogether. There is a gain on the whole in the percentage of failures which is too marked to escape notice. During the earlier part of the period represented, about two-thirds of the strikes as respects establishments involved wholly or partially succeeded. But more recently the proportion has declined, until in the last four years the failures have exceeded on the average the whole and partial successes. As a weapon against capital, therefore, the strike is losing its force. Labor has been unable to keep pace with capital in forming powerful combinations. United labor, it is demonstrated, cannot equal in power united capital, and labor seems to be realizing the fact. Evidences are not wanting that labor is beginning to lay more stress upon political action than upon mere unionism."

To South Polar Lands.

After an interval of fifty years the scientific world has taken up again the matter of Antarctic exploration, and it seems likely that during the coming year much important information will be obtained regarding a region of the earth's surface of which we as yet know hardly anything, whose area covers not less than 4,500,000 square miles—about once and a half that of the United States, and equal to that of the great Chinese empire. It was with good reason that at the last International Geographical Congress, held in London in the summer of 1895, says the New York Sun, the first general resolution of recommendations embodied the statement that the greatest piece of geographical work that was left for the future, and one that should be taken up immediately in the present, was the exploration of this terra or aqua incognita. Not since the days of Sir James Clark Ross and Capt. (afterward Commodore) Wilkes, of the United States navy, or the years 1840–42, has any systematic research been conducted in this great expanse of southern ice and water, the ice barriers of which have for one reason or another been assumed to render access to its deeper parts impossible. Yet, strange though it may appear, all this supposition of inaccessibility was based upon the experiences of gallant seamen whose highest resource was the sailing vessel, and to whom the modern methods of polar research, as they have been developed within the last quarter of a century, and particularly in the last decade—the period which compasses the remarkable work of Peary and Nansen—were practically unknown. Whether in the Arctic or in the Antarctic tracts, the work that was accomplished was done with the assistance of a heavy equipment, inefficient clothing, and a source of food supply which knew little or nothing of canned materials and that proper association of sweetmeats and vegetables which have done so much to banish scurvy from the sailor's Arctic dreams.

At the present time three expeditions are being planned or actually being placed in commission for the important work of discovery in the south polar regions. At the head of one of these will be the Norwegian, Borchgrevink, who, in association with his commander, Capt. Kristensen, in 1894–95, while on a whale catching cruise, reached Ross's trail latitude 74° south, and made the first landing on what is commonly designated the Antarctic continent, if in reality such a continental mass exists. Borchgrevink's fitness for this command seems eminently established, and the lucid, graphic, and wholly unpretentious account of his late experiences has placed to his credit a confidence similar to that which has been reposed in the still more illustrious sire of Norwegian soil, Fridtjof Nansen. To him scientific men owe the first discovery of vegetable forms as part of the product of the southern lands. Up to the year 1895, when fragments of what appear to be true lichens were picked up off the bleak and forbidding rocks of Cape Adarl, on Victoria Land, and the offlying Possession Island, it had been assumed that not a trace, type, or form of vegetation of any kind belonged to this inhospitable tract of the south—a tract of land or ice as destitute of terrestrial fauna as it was assumed to be of a covering or partially covering vegetation. Strangely contrasting is the discovery made by Capt. Larsen in 1893 on Seymour Island, a patch of Antarctic land lying almost due south of Patagonia, of an abundance of fossilized plant remains—remains not indicative of a low type of vegetable organization, but of the noble structure of the South American pine or Araucaria. However meager or absent may be vegetation of the far south to-day, the evidence is conclusive that at a former period of the earth's history, and one that is quite recent when measured by geological standards—perhaps extending no further back than 150,000 years, or even considerably less—a goodly vegetation of forest trees, and with it, doubtless, a multitude of herbaceous plants of various kinds, gave life, color, and freshness to the landscape of Antarctica, the landscape which to-day sees hardly more than giant glaciers, walls of ice hundreds of miles in length and as many feet in height, undulating mountain slopes buried beneath perhaps thousands of feet thickness of snow, and a few grandly smoking volcanic cones, like Erebus, sending skyward the products of the internal destruction of the earth.

The second expedition is planned under the direction of Lieut. Gerlache, a young Belgian, and it receives, in addition to the warm support of the town, Antwerp, from which it is expected to take its departure, the official patronage of the Belgian government in the shape of a timely financial backing; presumably, therefore, a possible failure on its part will not be due to the absence of those "sinews of war" which are so eminently necessary for this far-off exploration. It is gratifying to learn that the scientific men of America are fully awake to the importance of the explorations that are planned, and to the discoveries that await the successful investigator of Antarctica. At the last annual meeting of the American Society of Naturalists a committee was appointed to examine into the practicability and the ways and means of furthering an American Antarctic expedition. Profs. Angelo Heilprin and E. D. Cope, of Philadelphia, are members of this committee, and it is known that they strongly favor the immediate (so far as it may be possible) equipment of such an expedition. It is thought that $50,000 will cover an important reconnaissance, if not deep penetration, with one or more steam whalers from the Newfoundland or Norwegian fleet.

It seems likely that the points of attack for all expeditions will be the region of Graham Land, south of Patagonia, which lies nearer the base of operations than the Victoria Land of Ross, and offers additional advantages to exploration which are not found in the track lying south of Australia. It holds out, moreover, hopes of important scientific results even with the failure of the objective aim of any expedition—i. e., high penetration southward. It was in this track that Larsen obtained his fossil plant remains, and also a number of marine fossils, identical with those found by Darwin sixty years earlier in Patagonia, which so strongly point to a former connection with the South American continent. Somewhat eastward of this region Weddell, in 1823, penetrated to latitude 74° 15′ south, and the same year Capt. Benjamin Morrell, sailing from New York, and pretty much in Weddell's track, reached 70° 14′, reporting a moderately high temperature and a sea practically devoid of ice. How far beyond these points the assumed "impenetrable" barrier would be met, if met at all, only an effort at penetration can determine, as the inconstancy of the ice in this region is such as to throw its front edge to positions, depending upon the year, fully a thousand miles apart from each other. At all events, a chance is here presented.

Of the substance of our knowledge of Antarctica it must be said that most of it is bound up with the researches of Ross about Victoria Land, and with the less important ones that have been made in the region of Graham Land. Concerning the other land, island, or ice masses that have been designated Clarie Land, Sabrina Land, Enderby Land, Alexander Land, etc.—in fact, of the whole Wilkes Land—our information is confessedly scant, and surely not sufficient to build up the great Antarctic continent which has been made a restoration by many geographers. Of the meteorology of the region, and of tides, currents, etc., we know equally little, and manifestly still much less of the geology, zoology, and botany. The commonly accepted notion of the extreme severity of the south polar climate is not founded on fact, any more than was the supposition of the shallowness of the Arctic basin, which, among his many other discoveries, Nansen has now so completely dissipated. In fact, it is all but certain that the winter rigors are far less pronounced in the region about the South Pole than they are in the region of the far north, and that there is nothing there which approaches the —94° F. which is found at two or more tracts along the Lena River in Siberia, or even the almost annual —75° of Yakutsk. Again, the summer temperature, while there is seemingly much less of it, partakes in a measure of the balm of Greenland, the thermometer frequently marking as high as 40° and 45° F. above in the shade. The great ice masses are the disturbers of travel in the far south, but up to the present time they have not been brought face to face with vessels carrying steam, or those that are fitted for the exploration. The coming year will throw new and important light upon this as yet "darkest" tract of the earth's surface.

THE cost of Harveyized single forged nickel steel armor plate is about $170 per ton.

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THE SWORD WALKER.

BY WILLIAM B. CAULK.

Of all the daring tricks that have been introduced in the circus, none have caused more comment than the one in which a person, generally a lady, walks with bare feet up a ladder of sharp swords, treading directly on the sharp edges without any injury to the feet.

It is amusing to a person who is acquainted with the secret to hear the many explanations of "how it is done" offered by the spectators, yet none of them ever come near guessing the truth. This secret has been so jealously and successfully guarded that very few, even among the best informed experts know how it is performed.

That the explanation is as simple as the trick is surprising, the writer will now show.

From the illustration it will be seen how the swords are arranged in a rack with the cutting edges on top. The rack is usually about seven feet high, and eight swords are used. One of the most necessary points in the preparation for the trick is that the rack should stand firm, and the swords fit snug and tight in the slots made to receive them.

Usually the inspectors are invited to examine the rack as well as the swords, and paper is cut with the swords to show that they are really sharp. The secret is not in the swords or rack, but in the preparation of the performer's feet. In a pint of water as much alum is dissolved as the water will readily take up. To the alum water is added as much sulphate of zinc as will lie on a silver dime, and thoroughly dissolved.

A few minutes before doing the act the performer bathes the feet in this solution and allows them to dry without wiping. Just before leaving the dressing room the feet are dipped for a moment in as cold water as can be secured and at once wiped dry without rubbing

By placing the feet squarely on the swords there is no danger, but great care must be used not to allow the foot to slide or slip on the sword, or the result would be a very bad accident.

On leaving the circus in which one has seen the above act, visitors are almost sure to see before the ever present side show a large painting on which is the representation of a Mexican dancing with bare feet in a shallow box filled with broken glass.

If you are of an inquisitive nature, and have seen a lady walk with bare feet up a ladder of sharp swords, you enter the side show to see this new wonder.

On a raised platform is found a box about four feet long, three feet wide, and six inches deep, the bottom of which is covered with broken glass. In a few moments a man dressed in the Mexican costume appears on the platform, and proceeds to break a few old bottles and throw the broken glass in the box, then remove his shoes, shows his feet to be free from any covering, steps in the box, and dances among the glass. After he has finished dancing he shows his feet to be uninjured, and retires. The trick is performed in the following manner:

Secure a number of thick glass bottles, break them in rather small pieces and file or grind all the sharp edges round. This stock of glass you place in the center of a box made according to above measurement. Now soak your feet in strong alum water and wipe dry, and give them a thorough rubbing with pulverized rosin. Dust the inside of your shoes with rosin, put them on, and go upon the platform. Take some old lamp chimneys and bottles, break them in bits, and throw this fresh broken glass in the box around the edges and in the corners, not in the center. Remove your shoes, step in the center of box among the prepared glass, and do your dancing. Avoid the sides or corners of box where you have thrown the glass, and you run no risk of cutting your feet, especially if you use plenty of rosin.

SWORD WALKER.

GLASS DANCER.

THE late Robert H. Lamborn bequeathed $200,000 to the Academy of Natural Sciences of Philadelphia.

The Electrical Conductivity of Cement and Concrete.

Electrical engineers, especially those engaged in railways and similar works, would do well to study a recent paper by Dr. Lindeck, in which he describes some experiments which he has been conducting in order to determine the electrical conductivity of cement and concrete of various kinds. He finds that the resistance per cubic foot of pure cement blocks, when dry, is about 144 ohms, and that this falls as low as 43 ohms after immersion for about twenty-four hours in water, while it rises to 820 ohms after being exposed to a heat of 212° Fah. The admixture of sand or gravel with the cement increases its electrical resistance. In cases where blocks were made with one part of cement to seven parts of gravel their resistance when dry amounted to about 18,000 ohms, when wet to 72 ohms, and after exposure at 212° Fah. the resistance rose to about 2,000,000 ohms. If the highest results obtained for airtight concrete be taken at about 1,670 ohms per cubic foot, an insulation resistance of about ½ ohm per mile is obtained. These considerations become important when adopting the German practice of laying the rails of electrical railways in concrete. From experiments made with what is called asphalt concrete, it appears that the current range is very trifling, and if ordinary cement is used, it is only necessary to lay a thin layer of the asphalt concrete over it. The cost is then not excessive. Asphalt concrete consists of 50 per cent of broken stone, 20 per cent of coarse gravel, free from loam and sand, 12 per cent of asphalt, 8 per cent of coal tar pitch, and 10 per cent of coal tar. The original paper appeared in the Electrotech. Zeits., 1896, p. 180, says the English Electrical Review.

The Ascent of Aconcagua.

A special telegram to the Daily Chronicle announces that Mr. Fitzgerald and Zurbriggen, the Swiss guide, began to climb Mount Aconcagua, in the Andes, on Christmas Day. At a height of 21,000 feet, Gussfeldt's card, dated March, 1883, was found in a tin box, says Nature. The explorers had to descend to the valley for three days, but a second attempt was begun on December 30, and an altitude of 22,500 feet was reached on January 2. A third attempt to get to the top of Aconcagua was commenced a week later. The arête between the peaks, at a height of 23,000 feet, was reached on January 14. Mr. Fitzgerald then had to turn back, but Zurbriggen reached the summit, which is over 24,000 feet high. This is the greatest altitude yet attained by mountaineers. The following item of climbing history is abridged from an article in the Chronicle: "The serious business began with De Saussure, and has been going on ever since. He was soon followed by Humboldt, who climbed Chimborazo (19,000 feet) in 1802. The next climber to set foot on that mountain was Mr. Whymper, in the year 1880. The Jungfrau was first ascended in 1811, and the Finsteraarhorn in 1812. The other Swiss peaks have fallen one after the other —the Wetterhorn in 1854, Monte Rosa in 1855, and the Matterhorn in 1865. Mr. Freshfield scored the first great victory when he climbed Elbruz (18,526 feet) in 1868; but long before that Gerard had climbed to 19,410 feet on Porgyul in 1818. The highest climbs of later years have been those of Sir Martin Conway, who climbed Pioneer Peak, in the Himalayas, in 1892, and of Mr. Mummery and Mr. Hastings, who climbed to 21,000 feet on Nanga-Parbat. Dr. Gregory reached to about 16,000 feet on Mount Kenya, in Central Africa (20,000 feet high), and Hans Meyer reached to 16,830 feet on Kilima-Njaro. In Asia there are four colossal mountains which still defy all efforts. Mount Everest (29,000 feet) still lies far beyond the reach of man. Dapsang (28,700) is almost equally inaccessible. Tagarma (25,800) and Khan-Tengri (24,000) have yet to be scaled. Similarly, in Africa, the highest mountain is still a virgin; and though Mount Cook (12,349) has been climbed in New Zealand, Charles Louis (20,000) still remains unascended in New Guinea."

GLASS SOLUBLE IN WINE.—M. Henri Lavouroix has been making a series of experiments to find how much effect the quality of glass in a bottle has on wine, and the results have aroused the interest of wine dealers, says Invention. He states there is a direct chemical reaction between the glass and the material within the bottle, and he quotes a case in illustration. A wealthy retired merchant bought in France a lot of costly and rare wines in casks, samples of wine from each cask being given to him by the wine merchant. The new owner proceeded to have his wine racked off and bottled. Some days later some of the wine was served on his table, and he detected a strange, unpleasant taste which the wine that he had sampled did not have. A fresh bottle was served, and this was found to be similarly affected. Bottle after bottle was opened, with the same result, and the owner brought suit against the man who had sold him the wine, alleging that it was not like the samples. During the action some of the bottles were brought into court, and it was found that the glass in them had become opaque. These bottles were handed to a chemist, together with similar bottles that had never been filled with wine. An examination showed that the bottles that had been filled had lost a part of their lime, potash and soda, which had passed into solution, forming compounds with the acid ingredients of the wine that rendered it unfit to drink.

A CYCLE factory has been established at Copenhagen, Denmark, with an output of over 2,000 wheels per annum.

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RECENTLY PATENTED INVENTIONS.

Engineering.

BRIDGE WALL FOR BOILERS.—George W. Hayton, Brooklyn, N. Y. To securely hold and lock in place the bricks employed in making the bridge walls of boilers, preventing their being broken or knocked out by the firemen in raking the fires, this invention provides for the use of bricks having in their faces projections and recesses, whereby they are adapted to interlock with each other, while a key brick is made with grooves registering with corresponding grooves in adjacent bricks, keys being driven into the registering grooves. The set of bricks forming this improved bridge wall may be readily set up by a fireman or other unskilled person, and in case one set burns out, another may be readily set up by the attendant without the use of mortar.

STEAM BOILER INDICATOR.—John Parker, Bradford, England. This invention is for a simple and inexpensive device to indicate excessive rise and fall of the water level. A frame in which is arranged a float is connected with a tubular extension through the boiler shell, the float being at one end of a fulcrumed lever whose other end carries a counterbalance weight. Within the tubular extension inside the boiler is a valve seat engaged by a valve on the lever, and the undue fall of the water level raises the valve from its seat, permitting the water or steam to flow through the bore of the extension, and through a connected pipe outside, to give warning to the attendant. The device may also be arranged to give warning of an undue rise of water.

RAISING SUNKEN VESSELS.—John R. Grant, New York City. This invention relates to raising sunken vessels by inflated bags in the hold, and provides improved bags and attached parts whereby the bags may be inflated as desired without leakage of air or danger of bursting, or the closing of the air inlets by the folds of the bags. The bags have each an inner and outer shell of fabric, with two reinforce plates secured to its inner and outer sides and having orifices matching an orifice in the bag, gaskets being interposed between the plates and the shells. The air distributing pipe is so arranged that all the bags on a vessel will be uniformly inflated, that the vessel may be properly raised without listing.

Railway Appliances.

CONVERTIBLE CHAIR OR SEAT.—James M. Osgood, Boston, Mass. A seat or chair for day use, which may be readily converted into a berth for night occupation, is provided by this invention. A seat portion, upholstered on both sides, is mounted to rotate in a seat frame, a back frame recessed at opposite sides being pivotally connected to the seat portion, and an upholstered back section in each of the recesses is pivotally connected with the upper portion of the back frame, whereby they may be swung into or out of the recesses to form backs or a berth. The alternating seats are somewhat differently constructed, according as they are to be convertible into an upper or lower berth, and the improvement also comprises sectional partitions by which two staterooms are practically formed, one for the upper and the other for the lower berth.

DUST SCREEN FOR WINDOWS.—Hugh B. Shutts, Shawneetown, Ill. This is a screen especially adapted for use in connection with car windows, being readily applied at either side of the window frame and held in position by the sash, or being applied on the outside of the car on the panels between the windows. It has a box body with hooded top and bottom escape openings, an upright on the inner front portion of the body having a rib adapted to enter a sash groove, and the ends of the upright being recessed to receive the bottom rail of the sash. The screen is designed to prevent the entry of dust and cinders at an open window, and also causes a gentle draught of air from the car out through the window when the car is in motion.

Mining, Etc.

MINING CAISSON.—James M. Thorp, College Park, Cal. For mining the bedrock of rivers this invention provides a caisson that may be readily transferred from place to place, and which enables the miners to work directly on the river beds. The caisson is supported by floats which form a double hull boat, arranged with rails, a framework and platform, whereby the caison may be moved aboat and considerable space worked without moving the floats. It comprises an outer casing with lower work chamber open at the bottom, there being a fixed chamber portion and a vertically movable chamber portion. Bucket shafts open at the bottom into the working chamber and at the top in airtight chambers, from which chutes lead outwardly, workmen descending to the working chamber through an air-lock shaft.

Mechanical.

SAWING MACHINE.—Daniel J. Taft, Leon, Ky. An attachment has been devised by this inventor for automatically feeding and adjusting staves and similar articles to the saws in such a manner that the desired amount of surplus is cut off from either or both ends of the article. Two pivoted guides are mounted to swing in unison, and are engaged by the ends of the article to shift it transversely to bring the ends in proper position for the saws. The guides are readily set to proper position, and their free ends extend under a press roll which holds the stave in place while passing to the saws, another roll preventing the cutoff stave from being lifted while passing rearward between the saw blades.

GAGE FOR SEWING BELTS.—John Gregory, Newark, N. J. To properly locate wire lacing on a belt, a simple and inexpensive gage has been devised by this inventor, consisting of two hinged sections having front and rear plates connected by bars outwardly arched and diagonally placed, the two sets of bars producing the effect of a thread. Gage bars are fitted to the arched portions of the gage sections, the bars having outer convexed and inner flat faces, and one bar engaging the top face and the other the under face of the belt. In attaching lacing with this gage the strands alternately vary in length, one strand being short and the other longer.

Miscellaneous.

BICYCLE HANDLE BAR AND BRAKE.—Manuel A. Roso, New York City. This invention is for a strong, light and readily adjustable handle bar, whose ends may be made to stand in any desired position, and with which is combined a brake device to be operated by the handle bar. The stem or upright portion is clamped and adjustably held in the upright portion of the steering post in the ordinary way, a hollow head receiving the screw-threaded ends of horizontal tubular arms, in which are journaled a horizontal tube whose opposite ends receive the handles. Within a sleeve on the ends of the handles are flanges with serrations engaged by spring bolts on the hollow arms, the bolts acting as latches in adjusting the handles to desired position. In the hollow head is a sprocket wheel, and a chain and wire connection leads from it through the forward post and diagonal lower brace to a brake lever fulcrumed on the lower fork, and carrying a brake shoe adapted to engage the tire. On disengaging a spring catch on the handle bar, the brake may be applied by simply pressing down on the handles.

BICYCLE BRAKE.—William L. Stewart, Wilmerding, Pa. According to this improvement, the braking pressure is applied on the bicycle tire through a brake cylinder covered with canvas or similar material, the brake cylinder rotating more or less on contact with the tire, which it is designed not to injure in any way. The cylinder has a fixed and a removable end in which are central openings for the passage of trunnions of an inclosed bearing block having semicylindrical seats, each bearing on the top of a friction roller engaging the inner periphery of the cylinder below its center, the outer ends of the trunnions being engaged by a yoke from which an operating rod extends upward conveniently near the handle bar. By pressing down on the handle of the operating rod the brake cylinder is brought into engagement with the wheel tire, and the braking force is equal to the pressure between the friction rollers and the inner surface of the brake cylinder.

BICYCLE GEAR.—Christian A. Meister, Allentown, Pa. The hub of the rear wheel, according to this invention, has at opposite ends a large and a small sprocket wheel connected by sprocket chains with a large and a small sprocket wheel turning loosely on opposite ends of the crank shaft, the latter wheels having inwardly projecting hubs adapted to be engaged by a clutch sleeve. This sleeve has a circumferential groove receiving a loose collar connected with a clutch lever at whose upper end is a handle movable in a clip on the frame of the bicycle, the handle being held in engagement with opposite sides of the vertical brace bar. To change from a high to a low gear, or vice versa, it is only necessary to push the handle from engagement with one side into engagement with the other side of the frame.

PRINTING APPARATUS.—Joseph B. Mockbridge, New York City, and Julius G. Hocke, Bayonne, N. J. This invention is for an apparatus more especially for use in checking freight, to print characters on shipping receipts, etc., at the same time issuing a separate check or ticket with duplicate characters. It has two sets of type wheels, each comprising a series wheel, a consecutive numbering wheel and an indicating wheel, the corresponding wheels being connected with each other to rotate in unison, while a rod actuated by the operator, and connected mechanism, imparts motion to platens swinging toward and from the type wheels. Any desired number of impressions may be made on the document and on the paper reel, the impressions being consecutively numbered alike on both.

STARTING GATE FOR RACE TRACKS.—Philip McGinnis, Brooklyn, N. Y. This invention relates to devices for aligning and holding horses in proper position for starting on race tracks. It comprises posts at opposite sides of the track on which are brackets and sleeves supporting carriers and arms to which are attached barriers. The latter preferably consist of flexible material, such as leather, and are readily detached from the arms by the pressure of a horse against them. When the barrier or gate is in lowered position, the horses are aligned against it, the starter at the proper time pushing downward on a lever which releases a counterbalance and swings upward the arms, removing the barrier.

GATE.—Amon W. Chilcott, Stewartsville, Mo. This invention is for a gate which may be adjusted vertically in such a way as to raise its swinging or free end any desired distance from the ground, permitting the passage of small stock and enabling the gate to be easily operated when there are snow drifts. A crank shaft has one of its crank arms in link connection with an extension from the gate, the second arm being connected with a lock lever, while shifting arms extending beyond opposite sides of the gate also have a link connection with the lock lever. In opening and closing, the gate passes a dead center and will be locked in either its open or closed position, from which it may be released and swung in either direction by levers placed at opposite sides of the road or path crossed by the gate.

ELEVATOR DOORS AND SAFETY DEVICES.—Lucius N. Reed, Fulton, Ill. To operate the vertically swinging doors of elevator shafts, and automatically lock the elevator, should the hoisting rope break, the mechanism provided by this invention comprises a vertically movable rod having chain connections with the doors, and from which a cable extends around a pulley at the base of the shaft, the cable being attached to another pulley on whose shaft is an operating lever. Eccentrics mounted on shafts carried by the elevator car are adapted for engagement with brake strips arranged at opposite sides of the shaft, there being on the shafts segment gears, on one of which is a weighted extension, a holding device for which comprises a pivoted plate operated by atmospheric pressure, whereby the car will be automatically locked in the shaft should it commence to move downward too rapidly.

FUNNEL FOR DUST COLLECTORS.—Franz Prokupek, Milan, Italy. This device, which has also been patented in many foreign countries, has within its shell or body a number of vanes to break the current of air passing through, there being a fixed truncated cone supported on the vanes, and within the fixed cone a flexible cone adjustably held and adapted to receive atmospheric pressure and capable of being deformed to gradually contract or completely obstruct the lower orifice of the fixed cone. The device is adapted for weak as well as for strong currents of air, the funnel being mounted on any ordinary dust collecting apparatus, and the funnel and collector forming only a single apparatus after mounting.

WINDOW SHADE ROLLER AND BRACKET.—George M. Parsons, Carson, Nev. According to this improvement the spring of the spring roller may be quickly and conveniently placed under the desired tension when the roller is in position in its brackets, and the winding of the shade may be the more readily accomplished as the roller may be definitely turned but a partial revolution, an entire revolution, or a number of revolutions as required. In an offset member of the bracket is located a tension head forming practically a ratchet, and a spring shaft in the roller is connected with a winding disk at the end adjacent to the bracket, the arrangement being such that, by turning a key connected with the outer end of the tension head, the spring of the roller is placed under compression.

SLIDING DOOR AND CURTAIN SUPPORT.—William Abraham, Fairchild, and William Schroeder, Augusta, Wis. This improvement comprises a slotted tube forming a track in which travels a grooved ball, its groove registering with the slot of the tube, while a hanger formed of overlapping hook-shaped members engages the ball and extends through the slot to carry the door, curtain, etc. There is a pivot for the hook members and a washer on the pivot, to clamp the door or curtain in place between the washer and the pivot end of the hook members. The device is very neat and not liable to get out of order.

FOLDING TRESTLE.—Thomas A. Clarke, Portland, Oregon. This invention is for an improvement on a formerly patented invention of the same inventor, the trestle being designed to support a table or like articles, and to be readily set up or folded for storing away. It has a main post with oppositely arranged lower recesses in which are pivoted legs, there being also leg braces, while pivoted to the upper end of the post are outwardly extending arms. The stand when set up has five points of support, and is very firm.

REMOVABLE BACK FOR RAZORS.—Samuel H. Barrett, Wallace Groves, and Jent C. Brown, Woodhull, N. Y. This device consists of a straight back adapted to lie along the permanent back of the razor, and having at each end downwardly extending spring fingers by which the bar may be removably attached to the razor. The side edges of the bar are extended beyond the razor to engage the honing surface and more decidedly tilt the razor, the invention being especially useful where the permanent back of the razor has worn down from long service.

DRAWER GUIDE.—Torvald Hanson, Eau Claire, Wis. To compensate for shrinkage and wear of a drawer and the parts in which it slides, in furniture, store fixtures, etc., this invention provides laterally adjustable guides consisting of loosely contacting strips from which project threaded studs, contact bars attached to the case having apertures to receive the studs, and there being nuts on the studs between the contact bars and guide strips. The nuts are readily adjustable by a wrench bent to the required form.

CONTAGIOUS GERM INCINERATOR.—Helen S. Whitton, Fruitvale, Cal. This is a portable incinerator more especially adapted for consuming the discharges from diseased lungs, and comprises a vase-like shell covered by a close-fitting lid, and within which is a chafing dish. The incineration is effected by means of an alcohol or other lamp in the base of the shell, there being an annular draught passage around the thin walled chafing dish.

PUNITIVE CHAIR.—Sanford J. Baker, Oakland, Me. This is a chair made of metal slats, in which the occupant is to be held in sitting posture, though not bound, the chair forming substantially a cage secured on a wheel base, to be drawn to and left on a public square. It is designed for the confinement of drunkards, tramps, or other objectionable persons or criminals, the occupant being visible from the sides as well as the front. A table is secured to the front of the door and food is placed there for the occupant.

SIPHON RECEPTACLE.—John Nageldinger, New York City. To preserve fermentive liquids in their natural state by means of carbonic acid gas, and by the same means produce a siphonage from the vessel of any desired quantity of the liquid, is the object of this invention. A cap having a pendent carbonic acid receptacle extends down into the siphon receptacle, the cap having a closely fitting exterior jacket of non-corrosive material in which is a pressure regulator, which may be set to a predetermined amount of pressure, whereby every glass of liquid drawn will be as sparkling as the first glass. The device is simple and inexpensive, and especially adapted for preserving beer, wines, mineral waters, etc.

CAROUSEL.—Milton T. Weston, Kenton, O. This is a merry-go-round in which the frame and mast are tubular, and the mast may readily be made vertical, although the base rests on an inclined surface. Simple and inexpensive means are provided for driving the machine, and there is an independent driving mechanism for each carriage, the mechanism of one carriage, although stopped or no matter how worked, not interfering with the movement of the machine as a whole.

CATCH BASIN.—Martin J. Nelles, Chicago, Ill. This is a cylindrical basin, made in sections of tiles cemented together in horizontal tiers, each tier or row having a continuous top groove and a continuous bottom tenon, and the adjacent edges having ribs and grooves forming socket joints. The basin is indestructible by sewer gas or acid, takes but little mortar or cement, and may be built with less labor than the ordinary brick structure. A cracked or broken tile may be readily replaced by another, the several plates being of like size and form, so that any one may be used in any tier.

FOUNTAIN SPITTOON.—John C. Blair, Louisville, Ky. For attachment to dentists' chairs or separate supports, this improvement comprises a bowl in which a concave disk is arranged as a false bottom, a waste conduit extending down from a central aperture in the disk, while the inlet communicates with a space that separates the disk from the bowl proper. An upward flow of water is provided for to flush the bowl.

WATER CLOSET.—Miguel Morell, Santa Barbara, Cal. The casing of this closet is provided with connected flush and discharge pipes, and an interior case or pan containing a central receiving basin fits closely but removably therein. The closet is automatic in its action, and the parts are so constructed that they may be readily taken out for examination and cleaning.

DESIGN FOR SHADE ROLLER TIP.—William B. Shaw, Brooklyn, N. Y. This tip is in the form of a thin metal ferrule, having a longitudinal depression forming a channel in one side, with an annular flange near its outer end.

NOTE.—Copies of any of the above patents will be furnished by Munn & Co. for 10 cents each. Please send name of the patentee, title of invention, and date of this paper.

NEW BOOKS AND PUBLICATIONS.

COIL AND CURRENT, OR THE TRIUMPHS OF ELECTRICITY. By Henry Frith and W. Stepney Rawson. London: Ward, Lock & Company, Limited. 1896. Pp. 294. Price $1.25.

Mr. Frith is known already as an author in the field of popular science. This book is of the same type, and the associated authors present the entire field of electricity and electrical engineering in popular form. It is liberally illustrated and its interest is increased by the fact of the subject being treated from the Continental as well as English standpoint. It gives a specially good account of what is being done abroad in electrical engineering, we being too apt to forget that there are wonderfully active developments in electrical engineering in constant progress on the other side of the Atlantic Ocean. The book, we feel, deserves warm commendation. On page 241 we notice the reproduction of a SCIENTIFIC AMERICAN cut of a simple form of microphone due to Mr. George M. Hopkins. The author, however, omits the proper credit either to the originator of the very simple and satisfactory form of microphone or to the journal first publishing it.

PRINCIPLES OF MECHANISM. A Treatise on the Modification of Motion, by Means of the Elementary Combinations of Mechanism, or of the Parts of Machines. For use in college classes, by mechanical engineers, etc. By Stillman W. Robinson. First edition, first thousand. New York: John Wiley & Sons. London: Chapman & Hall, Limited. 1896. Pp. xv, 309. Price $3.

In this volume we have at last something which has long been due the inventor—a thoroughly scientific treatise on mechanical movements. They are treated from the standpoint at once of theory and practice, and the work embodies the substance of lectures given by the author during the past twenty-seven years. As the work is largely addressed to those more conversant with the drawing board than with mathematics, an effort has been made to treat the subjects from the standpoint of graphics rather than of pure analysis, which feature will popularize the work. The illustrations may be divided into two classes; diagrams, mechanical drawings of mechanisms, and, most interesting of all, process reproductions of actual models. We feel that we shall be true prophets in bespeaking a large and long continued sale of this work among those interested in practical mechanics.

CHEMISTRY FOR ENGINEERS AND MANUFACTURERS. A practical text book. By Bertram Blount and A. G. Bloxam. With illustrations. 1896. Volume III. Chemistry of Manufacturing Processes. London: Charles Griffin & Company, Limited. Pp. 484. Price $4.50.

The title page tells the story of this work. By authorship alone its character is guaranteed. The range of subjects treated within its less than 500 pages is very great, and the distribution of the subjects is so wide, the authors seeming not to be biased in one or the other branch of manufacture, that it really seems a most satisfactory production. We notice in the chemical equations, however, a certain amount of carelessness which shows itself in the indiscriminate use of subscript and full size multipliers of elements; but this criticism is a very minor one and we warmly commend the work to our readers. An unusually good table of contents, a short bibliography, and a really model index of over forty pages, with the numerous illustrations, and graphic, bond and plain formulæ, add no little to the value of the work. A single title may be cited to illustrate its thoroughness. Under oils, resins and varnishes, the suject of birdlime is awarded a paragraph, giving its chemical composition.

THE WHEREWITHAL; OR, NEW DISCOVERIES IN CAUSE AND EFFECT. Townsend. Price $1.

This work presents a system of thought and the composition from such general headings being given under which any subject can be printed. This system involves the idea of treating any topic from the standpoint of its causes and sources, its essentials, associations, incidents, and effects. What it illustrates and the conclusions it leads to are included in seven headings termed by the author "questioners." It reminds one of the divisions of a speech, the exordium, narration, proposition, argument, and peroration. There is no question that much is to be gained by adhering to such formulæ, and the wherewithal system will do much to assist in the presentation of any subject to the mind of an investigator or to his auditors.

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(7103) A. D. asks if the Edison dynamos require larger wire in armature than in field magnets. A. The armature may generally be wound with finer wire than that used on the field. The relative resistance of field and armature varies with the relative sizes of wire and is fixed by such considerations as the adoption of series, shunt, or compound winding.

(7104) J. H. W. writes: Suppose a thermometer to be frozen or embedded in a cake of ice, surrounding it say 6 inches on all sides. What temperature will it record under these circumstances, and to what extent will it subsequently be affected by exterior changes of temperature? Should the temperature fall say to 15° or 20°, will the embedded thermometer show an approximate fall? I suppose it would show no rise above 32° Fah. so long as any ice covered it. A. The ice will act as a protective covering and the thermometer will be but slowly affected by the temperature of the surrounding air. If time enough is given, the thermometer will assume such temperature if below 32° Fah. It will not rise above 32° Fah. until the ice has melted away from it and the bulb is exposed all or in part to the air. A thermometer embedded in ice may register any degree of heat below 32° Fah.

(7105) L. D. asks: 1. How many miniature lamps and of what size can be run with a storage battery 36 ampere hour, 2 volts, with a discharge of 4 amperes? A. The voltage is too low for a regular type lamp; the eight watts of your battery should give about one candle power. 2. What is the largest size motor that can be used with this battery? A. A small toy motor; the simple electric motor, SUPPLEMENT, No. 641, is too large.

TO INVENTORS.

An experience of nearly fifty years, and the preparation of more than one hundred thousand applications for patents at home and abroad, enable us to understand the laws and practice on both continents, and to possess unequaled facilities for procuring patents everywhere. A synopsis of the patent laws of the United States and all foreign countries may be had on application, and persons contemplating the securing of patents, either at home or abroad, are invited to write to this office for prices, which are low, in accordance with the times and our extensive facilities for conducting the business. Address MUNN & CO., office SCIENTIFIC AMERICAN, 361 Broadway, New York.

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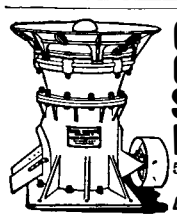

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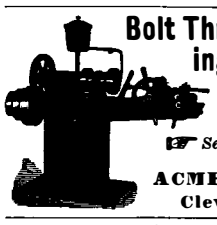

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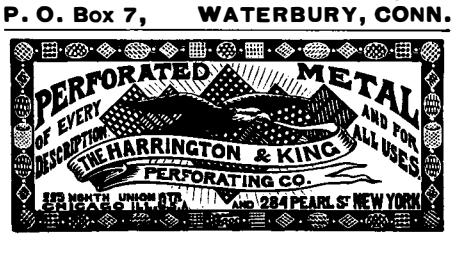
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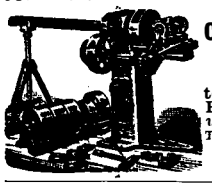

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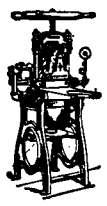

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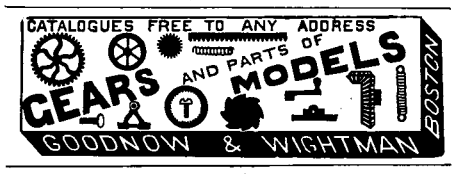

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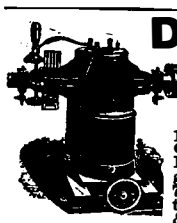

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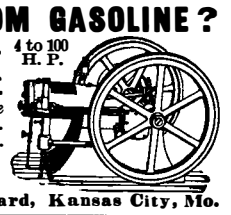

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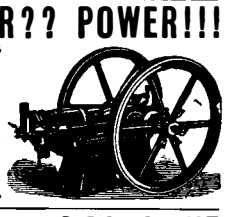

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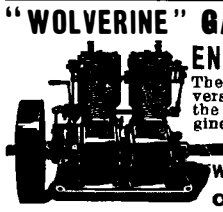

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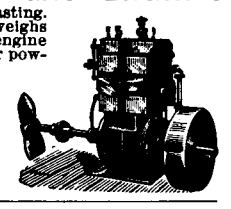

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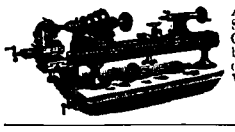

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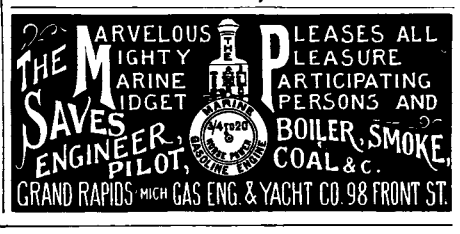
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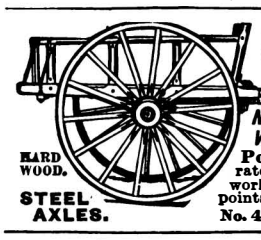

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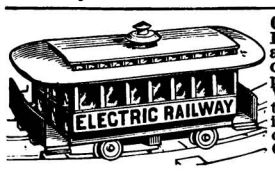

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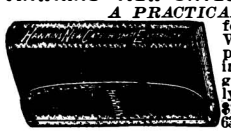

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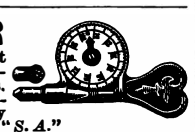

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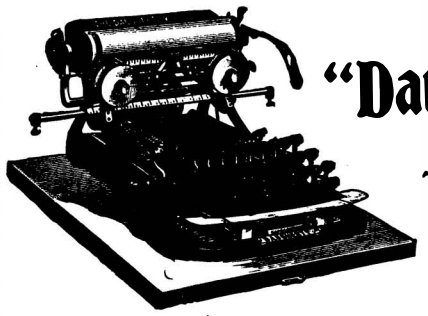

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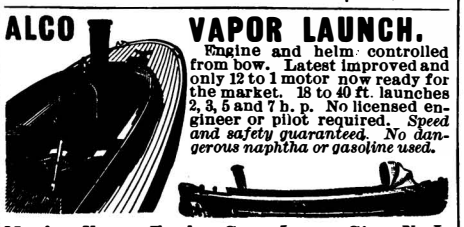

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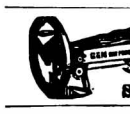

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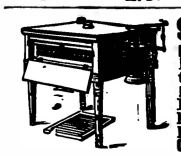

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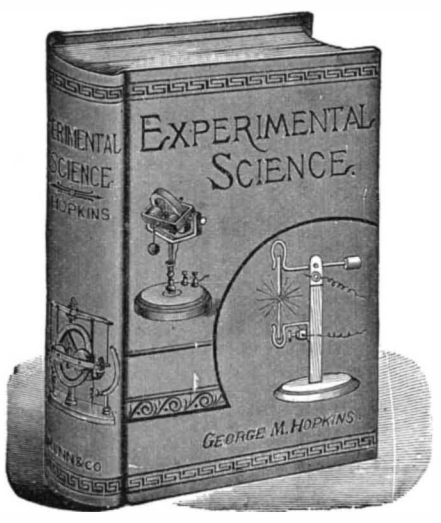

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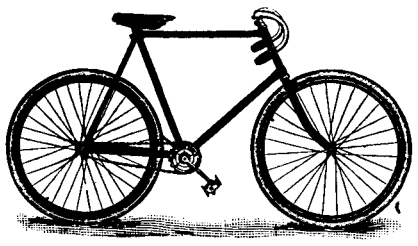

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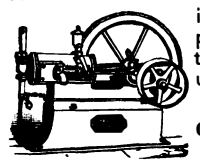

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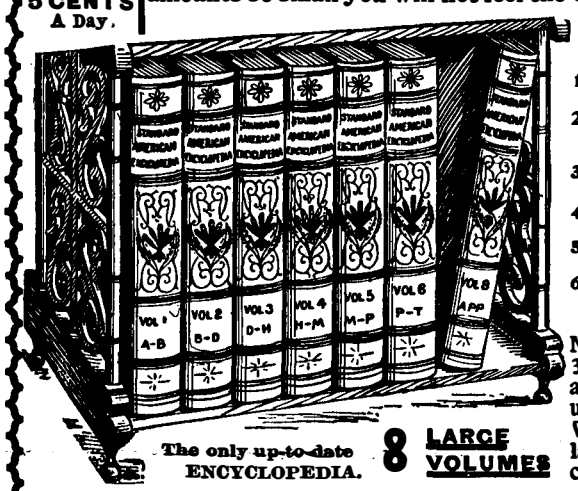

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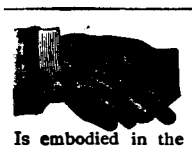

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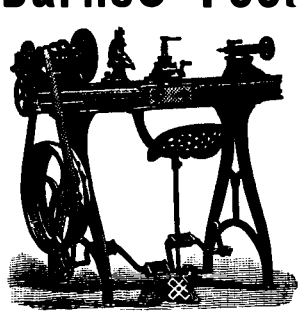

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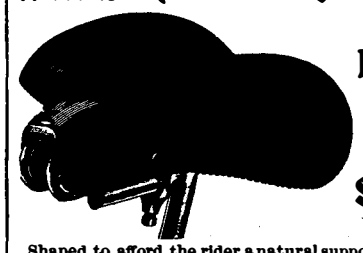

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